

Assessment of Water Sector Policies and Guidelines of Nepal:

Identifying Gaps and Addressing Needs



**Climate Adaptation and Resilience
(CARE) for South Asia Project**

**Assessment of Water
Sector Policies and
Guidelines of Nepal:**
Identifying Gaps and
Addressing Needs



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SM Tower 24th Floor No. 979/66-70 Phahonyothin Road,
Phaya Thai Sub-District Phaya Thai District, Bangkok 10400
Telephone: +66 2 298 0681-92
Website: www.adpc.net

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Government of Nepal
Water and Energy Commission
Secretariat

Phone No. 4211422
4211429
4211415
4211417
Fax No : 4211425

Singh Durbar
Kathmandu, Nepal

Ref :-

Date: 16 October 2023

Foreword

The water resources sector in Nepal is critical to our well-being and national prosperity. It plays a pivotal role in sustaining our communities, ecosystems, and economic prosperity. It is thus, important to manage this resource in a responsible and sustainable manner. The government of Nepal has prioritized this sector and recently set forth the National Water Resources Policy 2020 primarily aiming to sustainably conserve, manage and to carry out multipurpose development of available water resources contributing to the economic prosperity and transformation of the country.

The government has also drafted the new National Water Resources Bill, to replace the Water Resources Act, 1992 to set in place the required legal regime recognizing the multisectoral dimensions of water and embracing integrated water resource management principles. The Water and Energy Commission Secretariat is prioritizing and setting in motion the institutional reforms for better water governance.

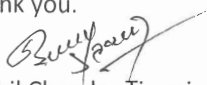
As we navigate the challenges posed by climate change, population growth, and increasing water demands, it is imperative that our water policies evolve to meet these challenges head-on. In this context, I appreciate the preparation of this report by the Asian Disaster Preparedness Center under a Technical Assistance from the World Bank reviewing thoroughly the water sector policies and instruments including related climate change policies and proposing recommendations to move forward.

This report presents an excellent summary of the development status of the water resources sector and the assessment of associated policies to identify the major issues and challenges understanding the gaps and needs of the sector along with meaningful recommendations to improve water resource management in the country. It is heartening to note that the report recommendations encompass the overall gamut of water resources development ranging from improving water information system to governance mechanisms in the federal set-up including capacity development, infrastructure development, stakeholder engagement, riparian cooperation and mechanisms to improve service delivery. These recommendations are also at the core of our efforts to improve water resource management in Nepal.

This report signifies our unwavering commitment to analyze, evaluate, and enhance our policies in the water sector. It is prepared through extensive research, consultation, and collaboration among experts, stakeholders, and government agencies. WECS is glad to be part of this exercise and supports the collaborative efforts that help guide the government in better formulating policies and directions in the water resources sector.

I would like to extend my gratitude to the authors, the supporting organizations, and institutions who have contributed to this report. This report will be a valuable input to the government and other partners in further shaping the future of water sector in Nepal.

Thank you.


Sushil Chandra Tiwari
Secretary

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We deeply appreciate the support provided by Secretaries of WECS and MoEWRI of the Government of Nepal, especially, Mr. Sagar Kumar Rai, Mr. Sushil Chandra Tiwari, Ms. Sarita Dawadi for their guidance and encouragement. The ADPC Team has greatly benefitted by the participation and discussions of many senior officials and experts at Ministry of Energy, Water Resources and Irrigation (MoEWRI), Water Energy Commission Secretariat (WECS), Department of Water Resources and Irrigation (DoWRI), and the Department of Electricity Development (DoED) in different meetings and workshops. We are grateful to their valuable inputs to those meeting that also helped us in improving the initial draft of this report.

This work emerged during the COVID-19 pandemic and lots of officials present, including some who have since retired, graciously responded to telephone calls and emails, provided ideas and information that were essential to write this report. We are also thankful to our Sector Focal Persons – Mr. Ram Gopal Kharbuja at MoEWRI; Dr. Santosh Kaini and Mr. Sanjeeb Baral at DoEWRI, and Mr. Kalanidhi Poudyal and Dr. Kapil Gnawali at WECS and for their facilitation and support.

ADPC also wishes to acknowledge the tireless efforts of its national team in Nepal and Headquarters in Bangkok in the development of this document. We extend our sincere thanks to all stakeholders, partners, and contributors whose valuable input and feedback were instrumental in shaping this report.

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List of Abbreviations

ADB	Asian Development Bank
AFOLU	Agriculture, Forestry, and Other Land Use
CBS	Central Bureau of Statistics
CRI	Climate Risk Index
DEM	Digital Elevation Model
DHM	Department of Hydrology and Meteorology
DoED	Department of Electricity Development
DWTFC	Drinking Water Tariff Fixation Commission
EPC	Environment Protection Council
ETFC	Electricity Tariff Fixation Commission
FAO	Food and Agriculture Organization of the United Nations
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Green House Gases
GLOFs	Glacial Lake Outburst Floods
GoN	Government of Nepal
GWP	Global Water Partnership
IBN	Investment Board Nepal
ILOSTAT	International Labour Organization Statistics
IMP	Irrigation Master Plan
IPPU	Industrial Processes and Product Use
IWRM	Integrated Water Resources Management
LAPA	Local Adaptation Plan of Action
masl	meters above sea level
MOEAP	Ministry of Economic Affairs and Planning
MoF	Ministry of Finance
MoFE	Ministry of Forest and Environment
MoIAL	Ministry of Internal Affairs and Law
MoITFE	Ministry of Industry, Tourism, Forestry and Environment Committee
MoLMAC	Ministry of Land Management, Agriculture, and Cooperatives
MOPE	Ministry of Population and Environment
MOPID	Ministry of Physical Infrastructure Development
MoSD	Ministry of Social Development
MW	Mega Watt
NAP	National Adaptation Plan

NAPA	National Adaptation Programme of Action
NEA	Nepal Electricity Authority
NDC	National Development Council
NPC	National Planning Commission
NWRDC	National Water Resources Development Council
O&M	Operations and Maintenance
REDD+	Reducing Emissions from Deforestation and Forest Degradation
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WB	The World Bank
WEC	Water and Energy Commission
WECS	Water Energy Commission Secretariat
WRRDC	Water Resource Research and Development Centre
VRA	Vulnerability and Risk Assessment

EXECUTIVE SUMMARY

Nepal, home to the mighty Himalayas, is rich in water resources; its rivers discharge about 225 billion m³ of water annually. Major rivers emerge from the snowfields and glaciers, cascade through gorges and valleys, and emerge into the flat lands of Terai. Despite the abundance of water and great potential for hydropower generation, these rivers are yet to deliver on the hope it offers in terms of being a means of prosperity for the nation. Furthermore, climate change impacts pose a serious threat to the livelihoods of the larger population and derail development efforts. Suitable policies must be established and implemented correctly to achieve the target of significantly improving the living conditions of the Nepali people sustainably.

A comprehensive review of the policies, strategies, plans, and legislations related to the water resources sector in Nepal was carried out recently under the CARE for South Asia project, and the necessary gaps and needs were identified. The study revealed that water policies in Nepal, underpinning the concept of integrated water resources management (IWRM), are evolving and attempting to conform to the recently adopted federal structure: the three tiers of governance in Nepal at the federal, provincial, and local levels.

The water resources of Nepal are spatially and temporally varying in nature, with problems of both abundance and shortages occurring at different times and locations. The hydropower development sector is still developing, as the nation recently emerged from the throes of load-shedding. The country's economy depends on agriculture, remittances, and the service sector, with the gross domestic product estimated at US \$1,085 (CBS, 2020). The aspirations and expectations of the people demand a policy environment that accelerates the growth of the water sector that, in turn, helps achieve the current slogan of 'prosperous Nepal-happy Nepali.'

Nepal's new Constitution, adopted in 2015, states that every citizen has the right to a clean and healthy environment. It further prescribes that the State shall carry out multi-purpose development of water resources, ensure energy availability, develop sustainable and reliable irrigation, and reduce water-induced disasters by adopting good river management. The new federal structure allocates the responsibility of managing water resources to all three tiers of government based on the size of projects.

The Water Resources Strategy 2002 was pivotal in directing the government to adopt a policy based on the conservation of resources, protection of the environment, and an understanding that river basins should be managed holistically by decentralized, autonomous, and accountable agencies underpinned by the ideas of economic efficiency as well as social equity. The National Water Plan 2005 (WECS, 2005) laid out short- medium- and long-term action plans to achieve the stated national goals. The National Water Plan envisioned a comprehensive new Water Resources Act, but Nepal's political scene impacted its formulation. Later attempts at passing the Bill were not successful. The Electricity Bill, which will replace the Electricity Act 2001, is also still pending.

The National Water Resources Policy 2020 was approved recently by the government with the goal "to sustainably conserve, manage and to carry out multipurpose development of available water resources to contribute to the economic prosperity and social transformation of the country." It accepts multisectoral dimensions of water and embraces IWRM principles adopting the basin as a unit of water administration. It spells out the objectives and lays out strategies to achieve them, and action plans define each. These include developing river basin plans, water accounting, defining allocations and performing auditing to monitor and inform decisions. It prescribes a science and fact-based approach to planning and management.

Importantly, it should be noted that the existing legal framework for water resources management in Nepal is still set out in the Water Resources Act 1992, as complemented by the Water Resources Rules 1993. The primary features of the Act, amongst others, are that the ownership of water resources lies with the nation; uses of water resources may only be lawfully undertaken based on a license and setting a priority order for the use of water resources. The order in priority is drinking water, irrigation,

agriculture, hydropower, and so on, and it is not based on economics or comparative loss and benefit analyses.

The government promulgated Irrigation Policy 2013, Hydropower Development Act 2001, and Environment Protection Act 2019, as well as more than 70 other related policies, acts, rules, etc., with direct bearings on the country's development and management of water resources. One can conclude that the water resources sector is a heavily regulated sector that often confuses the private sector and deters involvement.

The situation at the provincial level, however, is slightly different. The provincial governments have yet to fully enact their water-related legislations and conform to the spirit of federalism. The federal level needs to set standards, umbrella policies, and Acts to streamline provincial and local actions.

The review also showed a discord in policy statements and the actual implementation mechanisms in the country. Great policies exist, but the actual tools to implement them are missing. There are issues with both the availability of information and the extent of utilization of available resources. There are further immediate areas of concern in implementing the provisions of the constitution and the Water Resources Policy 2020.

These include clearly delineating the powers and responsibilities of the federal, provincial, and local authorities as directed by the constitution, for which a national consensus and political willpower is a must. A national agreement on the type and extent of development of water resources is also required. There is a need to translate policies into actions.

Institutions need to be strengthened in the planning, implementing, and monitoring of projects, along with attracting capital in the water sector. Specific strategies to address seasonal and spatial shortages, as well as build climate adaptation and resilience, are required. Water harvesting, inter-basin transfers, water use efficiencies and reuse, and groundwater development can be adopted for the sustainable development of the water sector in Nepal. Essential capacities for analyses, negotiations, and dialogue required for international or bilateral cooperation also need to be developed. Only then can the water sector be instrumental in helping to transform the nation into a more prosperous one.

Nepal's average annual water availability is more than sufficient to irrigate the 22,650 km² of agricultural land deemed irrigable if there were no spatial or temporal constraints. The government has prepared an irrigation masterplan (IMP 2019, still to be formally promulgated) to irrigate almost all irrigable land by 2050 through: Improved water supply, modernization of previously built systems, construction of new systems to be irrigated by surface water and groundwater as suitable in the Terai, and developing some systems in the hill areas through gravity or pumped systems.

Irrigation systems increase resilience to drought and climate change, help reduce poverty, and enhance the adaptation capabilities to climate change. It was estimated, in 2011, a total of 15 billion m³ of water was consumed annually in Nepal (WECS, 2011). The agriculture sector is the major consumer, with around 95.9% of the total consumption, while 3.8% is used for domestic purposes, and the remainder 0.3% is used up by the industrial sector. Current values can be estimated to be similar.

The key findings illustrate that performance ratings of the policies and institutional framework collectively demonstrate deficiencies in all three dimensions of water governance – effectiveness, efficiency, trust, and engagement. Definitive quantitative indicators to measure the performance of these three pillars and the associated 12 principles were difficult in Nepal as more data gathering is required. Qualitative assessments reveal the policy framework to be unsatisfactory and not fully conducive to addressing the primary pillars of the good governance framework.

The policy and guideline review report concluded with recommendations that the nation, in all of its governance systems, proactively plan and adapt to the challenges imposed by climate change by adopting a science-based decision-making approach in its policies. Though the country's policies

appear responsive overall, they need to be translated with proper action plans to be more sustainable and climate-resilient and fulfill the nation's obligations to future generations. The following needs to be the priority action areas in refining and developing policies, guidelines, and manuals for better developing and managing water resources in Nepal.

- To build a legal system for developing and managing water resources delineating the power and responsibilities of the federal, provincial and local level authorities assigning regulatory authority explicitly.
- To address seasonal fluctuations and spatial shortages by adopting suitable strategies, e.g., water harvesting for sufficient and sustainable availability of water which is likely to be affected by increasing climate risks.
- To develop sustainable and quality infrastructure to address problems of adverse climate change impacts, geological conditions and complex landforms and enhance water security, utilization, conservation and efficiencies.
- To extend and upgrade the hydro-meteorological measurement system to ensure that more reliable information is available for resource management planning and designing.
- To adopt a river basin approach in managing water resources with proper water accounting and auditing mechanisms.
- To maintain the standards of sustainable utilization, recharge, and quality of groundwater resources.
- To maintain a consensus among the various stakeholders, particularly at decision-making levels, concerned with developing and managing water resources.
- To garner the required capital for the development of the water resources sector.
- To maintain cooperation and collaboration with the downstream riparian countries, primarily focusing on a framework defining the bilateral relations and the key considerations.
- To train and build capacity in advocacy, planning, and implementation of climate-responsive water resources management and capacities in analysis, negotiating, and dialogue for international or bilateral negotiations.

1. INTRODUCTION

Asian Disaster Preparedness Center (ADPC) and Regional Integrated Multi-Hazard Early Warning System (RIMES) are jointly implementing a five-year (2020-2025) regional project called Climate Adaptation and Resilience (CARE) for South Asia with support from the World Bank. The overall objective of the project is to contribute to an enabling environment for climate resilience policies and investments in agriculture, transport, water, policy & planning, and finance sectors in South Asia. Initially, national-level activities are being implemented in Bangladesh, Nepal, and Pakistan.

The project has two parallel but distinct components: RIMES is implementing the first component, which focuses on promoting evidence-based climate-smart decision-making; ADPC is implementing the second component, which focuses on enhancing policies, standards, and capacities for climate-resilient development in South Asia.

As a part of the second component's activities in Nepal, ADPC reviewed the existing water sector and related policies, acts, laws, plans, strategies, treaties, and climate change to better understand the government's priority areas for the water sector's development and adequacy for climate-resilient water governance. This report presents the findings of the review study in terms of how these policies have effectively addressed national goals, delivered on aspirations, and improved water resources development in Nepal. The review also identified the gaps and needs in the policies, acts, and laws and provided recommendations for the water sector's development and adequacy for climate-resilient water governance.

Nepal is understood to be rich in water resources, in terms of average annual renewal water potential, with the rivers discharging about 225 billion m³ of water annually (WECS, 2011). Water resources in Nepal are a primary resource expected to contribute to the nation's growth, as stated by the national Water Resources Strategy of Nepal (WECS, 2002)¹. The 15th Five-Year Plan outlines the nation's long-term vision of a "Prosperous Nepal, Happy Nepali" by making Nepal a high-income country by 2043 (NPC, 2019). It is essential to manage water resources suitably to achieve the nation's long-term targets of development of the industry, transport, commercial, and agriculture sectors and to export surplus energy for the overall economic development of the country (WECS, 2013)², ensuring the climate change impacts align with development efforts.

The National Water Plan (WECS, 2005), laying down water sector objectives and policy principles, adopts Integrated Water Resources Management (IWRM) as the principle theme. It recognizes that sustainable development of water resources can significantly contribute to poverty alleviation and economic growth. The recently adopted National Water Resources Policy 2020, also embraces the principles of IWRM and river basin organization development to advance water resource management.

Nepal is highly vulnerable to climate change and disasters (World Bank Group, 2022; Eckstein et al., 2020) due to its young geological formations, high relief topography, highly variable monsoon-driven hydrology, a lack of resilient infrastructure, fragile socio-economic conditions, and sensitive ecosystems (Aryal et al., 2014). The overall livelihood being highly dependent on natural resources makes Nepal more vulnerable to the effects of climate change (Morton, 2007). The water resources sector is expected to be highly impacted by climate change (Agrawala et al., 2003; MoFE, 2019; WB and ADB, 2021).

Despite the abundance of water and large potential for hydropower generation, these rivers are yet to deliver on the dreams and hopes of prosperity to the nation as the nation is just emerging from extended power cuts (Timilsina & Steinbuks, 2021), poor year-round irrigation coverage (Baral, 2023)

¹ The Water Resources Strategy adopted by the government in 2002 is currently the existing strategy document defining the government's approach to water resources development and management in Nepal. The governance system has changed since then to the 3-tiered federal system with a new Constitution in 2015 after a protracted period of conflict and regime change.

² Upadhyaya and Gaudel (2018), on the other hand, analyze the inability to transform the abundance availability to the desired economic growth and societal welfare ascribing it to the political economy of the region. It describes the approach as based on myths and harsh realities of water resources management in Nepal.

and low water security (Nepal et al., 2021). These provide the impetus and relevance for a review of the water sector policies to understand the effectiveness of existing policies and identify potential areas for improvement to ensure that the stated goals of development are achieved with benefits accruing to all citizens.

1.1 Study Objectives

The objectives of this policy review report are to:

- Prepare a summary understanding of the government policies in practice along with the physical setting of existing water resource management scenarios, including major issues and concerns related to climate change, to better understand the problems to be addressed by the policy regime.
- Summarize key findings from the review identifying major issues and challenges in the water sector, issues of governance as well as interventions to address climate change impacts that the policy regime must address with key recommendations that need to be prioritized by water sector policies.

This review and its recommendations are intended to inform primarily the government sector in forming its policies, regulations, and directives and streamlining institutional and legal arrangements. The primary government agencies targeted are the Water Energy Commission Secretariat (WECS) and the Ministry of Energy, Water Resources and Irrigation, which set the national-level policy environment. The document will also be useful to the Provincial government concerned with water resources³. This is expected to aid the implementation of the National Water Resources Policy 2020, catalyze background for the issuance of the proposed National Water Resources Bill, and further set in motion the discussion in reforming the regulatory and implementation mechanisms of coordinated water resources policies in the three-tiered federal system.

The review is one of three undertaken for the pilot countries in the CARE for South Asia project, Bangladesh, Nepal, and Pakistan. These reviews will be synthesized into a policy brief for South Asia, which is to be a resource document for later interventions under CARE for South Asia project.

1.2 Study Approach

The review is based on a desk study, collating and reviewing policies, Acts and regulations, strategy, Master Plans, and other collections of reports and documents. The study uses the sequential 5-step-wise framework shown in Figure 1-1 below. It includes the processes of (i) defining the development goal; (ii) understanding the physical resource base, the water resources of Nepal, including water supply and demand and climate change impacts; (iii) identifying policy framework by exploring policy documents, institutional arrangements and coordination mechanisms (iv) analysis of policy contents, performance, gaps and integration of climate change aspects; and (v) consolidating the findings and recommendations for updating policies, implementation mechanisms, and the regulatory environment.

The overall review and analysis of the individual policies and the overall environment are further strengthened by the OECD framework for regulatory policy evaluation (OECD, 2014) as well as the OECD framework of good water governance principles (OECD, 2015), where possible, in evaluating the design, implementation and strategic outcome aspects of the policy instruments. The OECD water governance framework principles suggest three pillars (i) Effectiveness, (ii) Efficiency, and (iii) Trust and engagement. All these three pillars have four principles each, as shown in the pin-wheel diagram in Figure 1-2 below.

It was difficult to apply the OECD framework to assess policies in Nepal as it was developed for OECD countries with established market-based economies. It did, however, provide a basis for evaluation

³ Currently, the local municipal level neither possesses the human resources nor the institutional set up to be informed by or make use of the findings of this document. The review therefore is limited primarily to the federal and provincial levels.

qualitatively. Data and reliability of information to evaluate the budget, staffing, delivery processes, quality of outputs, intermediate outcomes, and strategic outcomes quantitatively in terms of economics, efficiency, perceptions, compliance, transparency, etc., for individual policies was difficult in Nepal. Institutions implemented several programs under different policies such that the cost of implementing a policy and accounting for the benefits of a single policy was difficult to quantify. Nonetheless, the overall review process in Chapter 3 is aided by the OECD frameworks qualitatively, where possible, relying on summary perceptions and evaluations.



Figure 1-1: Five-step sequential analytical framework adopted in reviewing water sector policies

The water sector's regulatory instruments, such as Acts, regulations, directives, various reports, documents, published and peer-reviewed literature, and project documents, were collected, screened, and scoped out for further review. Online web searches of the institutions' websites were made to download documents, while those listed but unavailable online were collected from relevant offices and contacts. Furthermore, formal and informal discussions were also held with government officials and experts in the field to update and enhance the general understanding essential for preparing this review.

The review work focused first on understanding the development goals and objectives, including constitutional mandates, strategy statements, planned programs, and execution of water governance in the country. Since IWRM is the underlying principle adopted in the strategy and policy documents, the regulatory instruments and arrangements were analyzed in terms of their effectiveness in IWRM institutionalization and operation in the country. An effort is made to deconstruct the key motivation of IWRM as a policy priority area and its adoption for addressing water resources issues- especially in terms of sustainable water resource management, adaptation, and resilience building in the face of climate change and water governance.

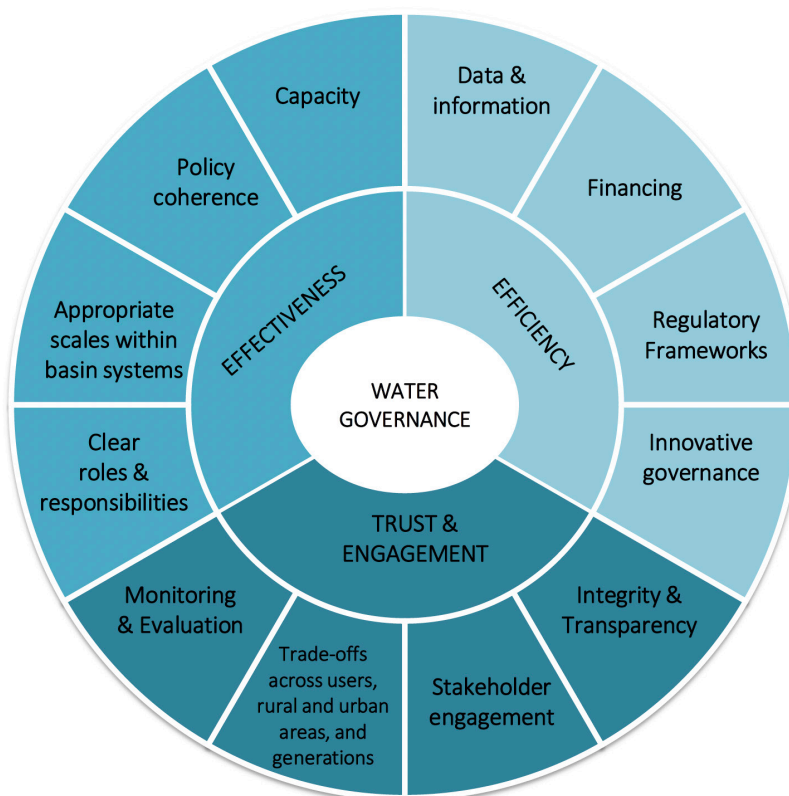


Figure 1-2: Framework of good water governance principles (OECD 2015)

The Acts and regulations prescribe approaches, procedures, and actions to achieve the desired goals or objectives. These do not explicitly provide information on gaps or needs. These were identified by consulting with government officials at the Ministry of Energy, Water Resources and Irrigation and offices thereunder, such as the departments, project offices, provincial governments, field offices, and the Water and Energy Commission Secretariat.

The analysis performed in this assignment primarily focused on the following:

- i. Setting the scene by defining the resource base – water resources potential, uses, demands, and the physical setting – is essential to enable an understanding of the opportunities, constraints, and requirements that the policies need to address.
- ii. Identifying and understanding the prevailing policy and legislation framework for the water sector, including the contents of the instruments, roles, and responsibilities of institutions and a measure of the efficacy towards achieving the desired objectives and development goals.
- iii. Opportunities for the inclusion of climate adaptation and resilience.
- iv. Identifying entry points for updating policies or implementation thereof, redefining the strategic directions, and making recommendations for better water resource management functioning.

The study also utilized the authors' individual experiences, project officials, and discussions. This report is presented with a brief background section, introducing the physical setting, the resources, and the concerns related to climate change in Chapter 2 before delving into the actual reviews of the policies and legal instruments related to water in Chapter 3. This Chapter also describes the institutional structure at the federal and provincial levels and the stakeholders identified. Chapter 4 describes the climate-related actions, the Nationally Determined Contributions in the context of water resources, and the integration of climate adaptation and resilience in water policies. The report continues with key findings, conclusions, and recommendations and attempts to tie them into the CARE for South Asia project interventions.

The gaps and need assessment of the IWRM approach in the country is also carried out and included as an Annex B to this report. The basic setting of the scene and the policy environment are not repeated in the annexure though the process and approach are separately described.

2. BACKGROUND

Nepal is a mountainous country in the central Himalayan region, located between China and India in South Asia, as shown in (Figure 2-1). It extends from 26°22' to 30°27'N in latitude and 80°04' to 88°12'E in longitude and includes the high Himalayas in the North, including the tallest mountain on the earth, Mt. Everest (8,848 m) and flatlands of Terai in the south.

Nepal recently went through a transformation from a centralized State to a three-tier federal system with the enactment of the new Constitution of Nepal in 2015 after a protracted insurgency. There are 7 Provinces with 753 local levels of urban and rural municipalities with larger autonomy than the lower governance units.

Nepal has a total area of 147,516 km², but a large portion (~86%) comprises hills and mountain areas. Forests cover about 43.4% of the country's area, while agricultural land is 24.1%. Almost half of the agricultural land is terraced farming, while the rest is Terai, flatlands, and valleys. The average annual precipitation ranges from less than 200 mm to areas with more than 5,000 mm. The average rainfall of Nepal is estimated to be from 1,530 mm (WECS, 2005) to 1,830 mm (MOFE, 2019)⁴.



Figure 2-1: Administrative provinces and the river basins of Nepal (adapted from www.ngiid.gov.np)

The Terai plain, Figure 2-2, is the grain belt of Nepal and occupies 14% of the nation's area with a tropical climate. The annual rainfall averages 1,100 – 3,000 mm. The Siwaliks, or the Chure range, north of Terai, is a range of hills with elevations ranging from 200 to 1,500 masl. The annual rainfall averages are similar to the Terai region, but the region is prone to landslides, mass wasting, and debris flow, being geologically young and fragile. This area is also the major recharge zone for the aquifers in the Terai region.

⁴ The average statistic varies depending upon the length of records used in the analysis.

The middle mountain region, Figure 2-2, with elevation from 1,000 to 3,000 masl and temperate climate averages of 275-2,300 mm of rainfall, is intersected by large rivers flowing north to south. The High Himalaya region includes the Himalayan Range and the areas north of it. The climate is of tundra and arctic type. It has an extremely rugged terrain with steep slopes and deep valleys. Some rivers – Kosi, Gandaki, and Karnali, predate the uplift of the Himalayan ranges and dissect the Himalayas through deep valleys. Precipitation is estimated to be 150-200 mm, though the weather instrumentation is scarce.

The Terai and the valleys in the middle mountains are prime areas for agriculture and residential purpose. The Irrigation Master Plan⁵ (IMP, 2019) states that out of the total net agricultural lands of 35,610 km², about 64% of this land, or only 22,650 km² has irrigation potential, while the rest is not irrigable. Soil erosion is a major issue in Nepal and a concern for the loss of productivity and land degradation. It also causes serious sediment issues in hydropower, irrigation systems, and other infrastructures.

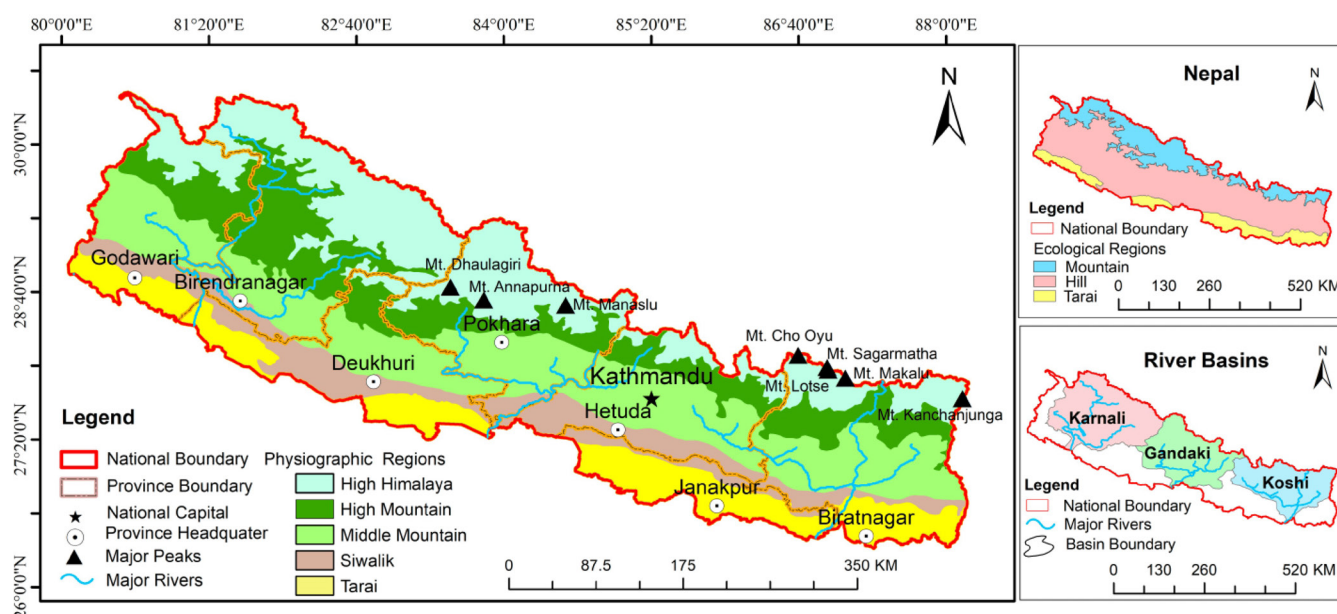


Figure 2-2: Physiographic regions of Nepal (Rai et al., 2023)

The current population of Nepal is estimated to be 30.27 million (<https://cbs.gov.np/>). Agriculture is the mainstay of Nepalese people. 60% of the population list agriculture as their prime occupation (CBS, 2012); it contributes about a quarter of the gross domestic product. The GDP per capita is estimated at US \$1,085 for the fiscal year 2019/20 (CBS, 2020). Remittance is the next major contributor, as a large portion of its youth goes outside the country for work, mostly as unskilled workers. Seasonal or temporary migration of youth, mostly men, have at places, created a shortage of young men for farm work in communities and has put on additional responsibilities and burden on women.

The rapid development of the agriculture sector with good irrigation facilities is essential to absorb and retain agricultural labor to transform the economy. Water is pivotal in supplying irrigation to enhance agricultural productivity and provide energy through hydropower generation.

2.1 Surface Water

The current estimate of the total volume of annual average surface water available in the country is 225 billion m³ per annum (WECS, 2003), equivalent to about 7,700 m³/person/year and a mean annual flow of 7,125 m³/s. The total discharge dwindles to about 1,000 m³/s in the dry months of February and March. Major rivers of Nepal are Mahakali, Karnali, Narayani (Gandaki), and Koshi.

⁵ The Master Plan is yet to be approved by the government.

These rivers, fed by snow and glaciers of the Himalayas, have appreciable dry season flow. The groundwater storage and delayed release from it are also suggested to contribute significantly to the annual water budget of large rivers (Andermann, 2012), as described by Bookhagen (2012); and more recent studies (Illean et al., 2021; Yao et al., 2021) highlight the importance of the vadose zone in discharge generation of mountain river systems, especially in the central Himalayan region. Figure 2-1 shows the river basins of Nepal. Nepal's freshwater accounts for an estimated 2.27% of the total world supply (WB and ADB, 2021).

Table 2-1 shows the basin areas and annual average runoffs and volumes of water discharged from the river basins of Nepal (WECS 2003). It should be noted that these values have been used in Nepal since the 1990s or even before, and newer estimates are warranted.

The first four rivers listed in Table 2-1 are major snow-fed rivers and contribute to about 78% of the total runoff volume. These are water surplus basins. The other rivers have large flows during rainy seasons, causing inundation and flood damage to large agricultural lands and infrastructures. They are water-deficit basins and have very low to almost no flows in the dry season.

**Table 2-1: River Basins of Nepal, Their Catchment Areas and Estimated Runoff
(Sources: WECS, 2002)**

SN	Basin (River) Names	Area of Basin		Average Annual Estimate		Fraction of total run-off from Nepal
		Overall (km ²)	Nepal Only (km ²)	Average Runoff (m ³ /s)	Volume (million m ³)	
1	Mahakali	15,260	5,410	698	22,012	78%
2	Karnali	44,000	41,890	1,441	45,443	
3	Narayani	34,960	28,090	1,753	55,283	
4	Sapta Koshi	60,400	31,940	1,658	52,287	
5	Babai	3,400	3,400	103	3,248	8%
6	West Rapti	6,500	6,500	224	7,064	
7	Bagmati	3,700	3,700	178	5,613	
8	Kankai	1,330	1,330	68	2,144	
9	Other Rivers (Kamala, Mechi and Southern Blocks)	24,921	24,921	1,001	31,568	14%
Total		194,471	147,181	7,125	224,662	100%

2.2 Groundwater

Nepal has good potential of groundwater resources in the Terai region, where the hydro-geology of the aquifers is favorable for obtaining water for irrigation and water supply as it is a part of the larger system of the Indo-Gangetic plains - one of the most productive aquifers in the subcontinent.

The outwash fans of rivers form the geological formations in the upper fringe of the Terai region, and the colluvium from the young sedimentary Siwaliks forms the Bhabar Zone. This zone is the main recharge area for the Terai aquifers, with the formations having a very high permeability in the range of 100-150 meters per day (WECS, 2005), and the average annual recharge exceeds 450 mm. The active or dynamic recharge volume ranges from 8,800 to 14,300 MCM annually (GDC, 1994; Shrestha et al., 2018; Kansakar, 2011, McNellis, 1993). Another recent report (IMP, 2019) estimates that the average annual renewable groundwater resources for the Terai region is of the order of 13 billion m³, and the Eastern Terai has a higher annual recharge and storage yield than the Western Terai.

2.3 Water Resources Potential

The water resources in Nepal have a large potential for development, and the efforts to date are far from satisfactory. The extent of utilization of this key strategic resource is extremely low. The obvious potentials are irrigation and hydropower, while drinking water, navigation flows, environmental, recreational, and religious uses, and potentials also exist. The benefits are not only for Nepal but also for the riparian countries India and Bangladesh.

2.3.1 Irrigation

The available annual water volume is more than sufficient to irrigate all 22,650 km² of irrigable agricultural land if there are no spatial or temporal constraints (IMP, 2019). Irrigation is a consumptive use and a priority accorded by the Water Resources Act. It directly benefits the rural agricultural population. But there do remain technical and socio-economic difficulties in making it perform better. Only a third of the total irrigated area in Nepal receives year-round irrigation. There are temporal and spatial discords in irrigation needs and water availability. The option is to either have storage projects to harvest water during excess flow season or inter-basin transfers from rivers with surplus water to deficient areas. The earlier government approaches, including the Water Resources Strategy 2002, had opted for the storage options, while recently, the government has promoted the latter option of inter-basin diversions. The recently prepared Irrigation Master Plan 2019 shifts the attention to the latter to enhance irrigation through inter-basin transfers, the improved water supply, modernization of built systems, utilizing groundwater, and adoption of pumped systems in the Terai and suitable hill areas. Renewable energy and newer technology, such as solar pumps, to pump water to suitable areas to increase productivity have also been proposed and are in practice to some extent.

Irrigation systems increase resilience to drought and climate change, such as shifts in rainfall patterns, delayed monsoon season, and increasing delays between subsequent rain events. It helps assure farmers of the delivery of crop water requirements, increase cropping intensity and crop production to help in livelihood protection, poverty reduction and enhance the adaptation capabilities to climate change. These relate directly to the national developmental goals.

Table 2-2: Theoretical and Economic Hydropower Potentials of Nepal

River Basin	Theoretical Potential (MW)			Economic Potential (MW)	
	Rivers with Basin Area >1000 km ²	Rivers with Basin Area 300-1000 km ²	Total (MW)	Number of Sites	Economic Potential Capacity (MW)
Koshi	18,750	3,600	22,350	40	10,860
Gandaki	17,950	2,700	20,650	12	5,270
Karnali and Mahakali	32,680	3,500	36,180	7	24,000
				5	1,125
Southern Rivers	3,070	1,040	4,110	2	878
Total Nepal	72,450	10,840	83,290	66	42,133

2.3.2 Hydropower

The hydropower potential of Nepalese rivers is high. The larger rivers originate in the snowclad highlands above 5,000 m and have a significant volume of water cascading through steep slopes through deep river valleys and emerge into the Terai plain. The elevation of the Terai ranges from 64 m to 200 m. Therefore, the rivers of Nepal have high discharges and elevation drops within a short distance which translates, theoretically, into a large potential for hydropower generation.

Numerous documents and reports since the 1960s state that the theoretical hydropower potential is 83,290 MW, whereas the economic potential is 42,133 MW (WECS, 2013), as summarized in Table 2-2.

It should be noted that large-scale development of irrigation and hydropower is concomitant with broader socio-economic and environmental issues involving the construction of dams, reservoirs, inundation, and often diversion of water from one basin to another. Suitable policies and safeguards must be enforced to ensure good practices are adopted. A priority area deserving more attention is the requirement of environmental flows, where the power producers are inclined to drive their turbines more to enhance their revenue stream.

2.4 Current and Projected Water Demand

The sectoral water demands available are rather outdated. It was reported, in 2011, that 15 billion m³ was consumed yearly (WECS, 2011). The agriculture sector is the major consumer, with around 95.9 % of the total consumption, while 3.8% is used for domestic purposes, and the remainder 0.3% is used up by the industrial sector. Hydropower use is a non-consumptive use as it does not consume any water, though it may alter water's spatial and temporal availability. The total installed capacity of hydropower plants in Nepal is reported to be 1,278 MW (NEA, 2020).

No research or documents were found during our review stating the current use and projected sectoral demands with detailed accounting. A preliminary analysis using the water requirement ratio, which is also commonly referred to as the annual irrigation efficiency, states that the irrigation use of water in 2002 was 9.32 km³ per year (9,320 million m³) (FAO, AQUASTAT, <http://www.fao.org/aquastat/>). This database shows that the annual total water withdrawal for the year 2002 was 9.536 km³. Another report (Kumar et al., 2016) with unavailable cited reports states that the total consumptive use in 2002 was 13,880 million m³ per year, which was estimated to grow to 38,980 million m³ eventually.

Our estimates included in the IWRM approach report with a water supply and demand estimation (Sharma et al., 2022) show that the current demand for water, including irrigation, drinking water and industrial usage, etc., add up to 18,714 million m³ meters and the future demand is 32,164 million m³ in 30 years. The existing total demand, excluding hydropower and environmental demands, is a mere 8% of the total average annual water runoff.

The existing irrigation use of 17,452 MCM is 93.3 % of the total demand. The drinking water requirement is 5.7%, while industrial usage is about 1%. This does not include the e-flow requirements and the required flow depth and velocity for rafting, navigation, religious or cultural uses, etc.

It must be noted that the irrigation use would reduce source water flow as it is considered consumptive. In practice, it does not consume the whole diverted water, but appreciable return flow occurs by recharging drains or streams downstream of the command areas and the underlying groundwater. Similarly, most diverted domestic water returns as used water through drainage and sewer systems.

2.5 Transboundary Water Resources

Nepal borders China to the North and India to the East, South, and West. As is evident from the analysis of the figures in Table 2-1, the first 4 rivers also drain catchments in India and China. The Mahakali has a larger drainage area in India than in Nepal. Humla Karnali, a tributary of the Karnali River; Trishuli, a tributary of the Gandaki River; Arun and Tamkoshi rivers, tributaries of the Koshi River, all drain considerable areas in China. Mechi River in the East also drains some areas of India as it forms a boundary river at some reaches. All rivers from Nepal flow from Nepal into India and ultimately join the Ganges River. Nepal is thus a downstream riparian country, with respect to China, and an upstream riparian country, with respect to India, regarding the rivers mentioned above. The Ganges continues to flow eastward and passes through Bangladesh also.

Regional expectations from India and Bangladesh, as perceived from a lot of reports, is that the excess monsoon water causing flooding in downstream countries could be stored in Nepal in large surface storage projects so that a controlled release can be done during the lean flow season to augment the flow in the Ganges. This would alleviate flooding and help irrigate millions of hectares of land and navigation. The rivers in Nepal are considered the most effective sources as their dry season contribution to the flow of the Ganges at Farakka Dam is about 71%, and their annual contribution is about 41% (Khan, 1996). On the other hand, these large reservoir projects would inundate fertile valleys and inhabited areas, cause immense socio-economic and environmental costs, and are deemed unacceptable to the local inhabitants.

The above factor clearly describes the regional dimension of this resource and upstream-downstream linkages of water that could be strained by climate change with increased flooding or low water levels.

2.6 Major Issues and Concerns Related to Climate Change

Climate change impacts in Nepal and everywhere are primarily felt through water (IPCC, 2022). Rising temperatures due to climate change impact water because the radiant energy and the ambient temperature directly drive water vapor, wind, and hydrological fluxes. Nepal contributes only 0.027% to global greenhouse gas (GHG) emissions but is one of the most vulnerable to the impacts of climate change (MOPE, 2016). Nepal ranked 9th on the long-term Climate Risk Index (CRI), averaging the annual values from 1999 to 2018 (Eckstein et al., 2020).

The 6th Assessment Report correctly establishes linkages between climate change-induced water insecurity, migration, and conflicts (IPCC, 2022). It states that snowmelt water is likely to decline in some snowmelt-dependent river basins by up to 20%. Food security risks will be more severe, causing malnutrition and micro-nutrient deficiencies in many areas, including South Asia at 2°C or higher global warming level.

The increased temperatures and increased extremities will mean more floods and droughts, creating more pressure on communities. Droughts will mean a shortage of water for household uses and irrigation and a general decrease in soil moisture, putting even more pressure on water projects. Droughts lead to a reduction in crop yields and food scarcity. Elevated temperatures will mean higher evapotranspiration, leading to greater evaporation losses from water storage reservoirs, ponds, and lakes. This will be a loss of water to the utility at that point.

A diagnostic study (ADB, 2020) estimates that 1.9 million people are highly vulnerable, and an additional 10 million are increasingly at risk of potential climate change impacts. The economic cost of climate change in agriculture, hydropower, and water-induced disasters is estimated at 2%–3% of GDP per year by 2050.

With the increased temperature, the increases being more at higher elevations, snowfields, glaciers, and permafrost melting will be accelerated in Nepal, causing an increase in spring and early summer discharges. Furthermore, increasing amounts of precipitation will be in the form of rain, higher temperatures causing rainfall rather than snowfalls, and decreasing snow fields and ice storage. These are expected to alter the river hydrographs and possibly available water resources.

One of the major issues in climate change is the wide variation and uncertainty in quantifying the future impacts to be usable at local scales by administrators. Estimated rainfall and discharge values depend on the methodology to translate global circulation models to local levels. Choosing certain circulation models, regional models, scenarios of representative concentration pathways, and downscaling to local levels always introduces errors, and the model's outcomes are still probabilistic. How to estimate the future climate accurately and convey this uncertainty and risk in a manner that the decision-makers can understand is a major issue and a challenge for scientists and technicians in climate science.

This further translates to the dilemma of the water resource engineers at the field level as the questions on exceedance levels and probabilities of events arise, confusing design criteria, operational procedures, and defining economic feasibilities. Climate change challenges the classical concepts of stationarity in hydrological sciences such that the future will be different and the extreme events will invoke cascading risks and damages.

Some other major issues and concerns related to climate change are summarized below (adapted from WB and ADB, 2021)^{6,7}.

Increase in average overall temperature: Warming in Nepal is projected to be higher than the global average, with the higher elevations heating more. The temperature is estimated to rise by 1.2°C–4.2°C compared to 1986–2005 under the RCP8.5 high emission scenario.

The range in temperatures is going to increase more. The minimum and maximum temperatures are expected to be more extreme so that the range will be greater than the change in average temperature. The temperature increase is expected to be higher in the winter months.

The environment will be changing too. Climate change is already impacting the environment in Nepal, with tropical species being observed at higher elevations. Insects and vectors of diseases not found in hills are now getting common. Invasion of weeds and foreign plants could alter the flora of a region, while fauna will be finding new habitats. These all affect the ecosystem and the watershed.

Increased natural hazard intensities or occurrences. Natural hazards such as drought, heatwaves, cold waves, river flooding, and glacial lake outburst flooding will soon be stronger or more frequent, further increasing disaster risks and endangering human lives and property. For example, it has been suggested that the number of people annually affected by river flooding could be more than double by 2030 while the economic costs of flooding would be even higher (triple).

The vulnerable will be the hardest hit, and inequalities will rise. Communities that are poor and living in remote areas and barely making a living with subsistence agriculture are likely to be hit harder by climate change. Some important adaptation methods, such as irrigation, water storage, new crop varieties, and air-conditioning, will be out of reach to these communities. Inequalities will widen and further limit access to resources for people experiencing poverty and the vulnerable.

Increased Migration. Unable to sustain their livelihoods due to scarcity of water and produces, communities will leave for more rewarding locations seeking better opportunities. It has already been seen that some hamlets and villages have moved on due to a shortage of drinking water supply.

To address the effects of climate change, the Government of Nepal was preparing its National and Local Adaptation Program of Action (NAPA and LAPA) and completed the National Adaptation Plan (NAP) (MoFE, 2021), whose summary for policy makers has been released and the main document is still awaited. These documents identify different priority actions and recognize the need for local-level adaptation. The implementation remains a challenge in terms of resource limitations. This includes funding gaps and capacities to implement adaptation activities at all levels of governance.

⁶ Climate Change Knowledge Portal of the World Bank also offers additional information on climate change trends, projections, extreme events and risks. <https://climateknowledgeportal.worldbank.org/country/nepal>

⁷ The Climate Risk Country Profile (2021), prepared jointly by the World Bank Group and the Asian Development Bank, provides comprehensive overviews of trends and projected changes in key climate parameters, sector-specific implications, relevant policies and programs, adaptation priorities and opportunities for further actions.

3. POLICIES AND LEGAL INSTRUMENTS RELATED TO WATER IN NEPAL

The national policies and regulatory framework related to water are targeted to achieve the national vision of a “Prosperous Nepal, Happy Nepali” by making Nepal a high-income country by the Year 2043 (NPC, 2019) and a goal for the water sector is that the “living conditions of Nepali people are significantly improved in a sustainable manner.”

3.1 National Water Policies/Guidelines/Acts/Laws

The policy is a principle or a rule to guide decisions and achieve desired outcomes, while strategy is the way or method adopted to bring about the desired outcome. Policies in the water sector have traditionally evolved from an urgency of ensuring collective action on a common resource for the good of all. Traditional practices in farmers-managed irrigation systems, water supply schemes, or the development of river banks are evidence of sustainable practices in Nepal and the region. These were based on well-enforced and regulated traditional practices and have performed well.

The constitution of any country is the ultimate source of all policies, strategies, and legal frameworks that define how the country is to be governed. Traditional communal activities in the water resources sector have gradually eroded as formal government activities emerged. Nowadays, developing an irrigation system is primarily a state responsibility in Nepal of either of the three levels of government – the federal, province, and local levels. Hydropower is open to private investments. Policies have evolved in the hydropower sector seeking private and foreign investments, though the authority to enforce or manage schemes is delegated to different institutions and levels.

3.1.1 Constitution of Nepal 2015

Nepal's new Constitution, adopted in 2015⁸, ushers in the federal structure of the polity with three tiers of governance – federal, province, and local municipalities. It defines the functions, in terms of water and related areas of the natural environment, that every citizen has the right to a clean and healthy environment - Article 30(1), and the right of access to clean drinking water and sanitation - Article 35 (4). It also decrees that the State policy shall, among other matters, be the following related to water.

- To carry out multi-purpose development of water resources while giving priority to domestic investment based on public participation.
- To ensure that a reliable supply of energy is affordable and available with ease, and to make good use of energy, for the fulfillment of the basic needs of citizens, by generating and developing renewable energy.
- To develop sustainable and reliable irrigation, controlling water-induced disasters, and adopting good river management (Article 51).

These are constitutionally mandated actionable targets for water governance in Nepal. The Constitution provides for a central federal nation with 7 Provinces and 753 local levels of urban and rural municipalities (Article 56). The distribution of powers between the three levels is specified in Article 57 with lists contained in schedules to the Constitution, with the Federation enjoying a residual authority on any matter not included therein. Articles 59 and 60 address the important aspect of financial authority and the distribution of revenues.

Schedules 5 to 9 of the constitution are important in allocating and managing Nepal's water resources, which specify authorities and how they are distributed. Schedule 9 establishes those

⁸ The policies and Acts in Nepal are officially written with the Nepali calendar year in which it was enacted. These dates are converted to the Gregorian calendar here for ease of understanding

powers to be held concurrently by the Federation, States, and the Local Level – and water features strongly in these powers.

As can be seen from Table 3-1, certain matters are subject to the concurrent jurisdiction of the Federation and the Provinces, while some are of all three levels. Understanding with clarity on how to implement these provisions concerning water amongst the three tiers of government is therefore a foundational requirement to be able to better plan, manage and safeguard the nation's water resources.

Table 3-1: Overlaps in Jurisdiction of the Federal, Province, and Local Levels

Entities	Schedule	Item No. and Item of the schedule
Federal Jurisdiction only	5	7. International treaties or agreements, mutual legal assistance, international borders, international boundary rivers 11. Policies relating to conservation and multiple uses of water resources 14. Central level: large electricity, irrigation, and other projects 27. National and international environment management, national parks, wildlife reserves and wetlands, national forest policies, and carbon services
Province Jurisdiction	6	7. Province-level electricity, irrigation, and water supply services, navigation 19. Use of forests and waters and management of the environment within the Province
Concurrent jurisdiction of the Federation and the Provinces	7	13. Province boundary rivers, waterways, environment protection, biological diversity 18. Tourism, water supply, and sanitation 23. Utilization of forests, mountains, forest conservation areas, and waters flowing between and across provinces
Local municipalities Jurisdiction	8	19. Water supply, small hydropower projects, alternative energy 21. Protection of watersheds, wildlife, mines, and minerals
Concurrent jurisdiction of the Federation, Provinces and Local Level	9	5. Services such as electricity, water supply, irrigation 7. Forests, wildlife, birds, water uses, environment, ecology, and bio-diversity 14. Royalty from natural resources

One should understand that the Constitution is relatively new. The three-tier governance structure needs some time to mature itself and come to terms with its responsibilities, authorities, and limitations. The guidance for implementing the concurrent powers must be soon defined for all three tiers of government to remove confusion. It is also to be noted that potential investors in new water resources projects will see this lack of clarity as a significant project risk and may deter investment.

It is also important that a clear and robust dispute settlement procedure is set up that can be accessed by the three tiers of government, communities, and individuals.

Previously under the Water Resources Rules 2050⁹ (1993), Chapter 4 and Rule 28, there was a stipulation for a committee that could undertake investigations of water disputes, and this was headed by a representative of the water resources ministry, with members representing relevant district development committee and the NPC regional office. However, this provision was made before the enactment of the new constitution and government system, so this either needs to be revised or replaced by a new set of procedures and entities.

3.1.2 Water Resources Strategy 2002

The Government of Nepal had earlier, in 2002, formulated a National Water Resources Strategy defining the national goal as “living conditions of Nepali people are significantly improved in a sustainable manner.” The strategy, in 2002, laid out the short-term (5 years), medium-term (15 years), and long-term (25 years) targets obtained through a number of stakeholder consultations.

The policy principles that drove the strategy formulation included adopting IWRM principles based on the conservation of resources and, protecting the environment, understanding that the river basin should be managed holistically. It further stressed the belief in decentralized, autonomous, and accountable agencies underpinned by the ideas of economic efficiency as well as social equity.

The objective of the strategy was defined as the following:

- helping in the reduction of the incidences of poverty, unemployment, and under-employment;
- providing access to safe and adequate drinking water and sanitation to ensure health security;
- increasing agricultural production and productivity, ensuring food security of the nation;
- generating hydropower to satisfy national energy requirements and to export surplus energy;
- supplying the needs of the industrial and other sectors of the economy;
- facilitating water transport, particularly connected to a seaport;
- protecting the environment and conserve the biodiversity of natural habitat; and
- preventing and mitigating water-induced disasters

The above list shows an attempt at a holistic approach to water resources development, the first of its kind. It recognizes water resources as a path to the overall development of Nepalese society. The strategy laid out ten outputs in three categories related to security, usage, and mechanisms, as listed below:

Security:

1. Effective measures to manage and mitigate water-induced disasters are made functional.
2. Sustainable management of watersheds and aquatic ecosystems is achieved.

Uses:

1. An adequate supply of and access to potable water, sanitation and hygiene awareness is provided.
2. Appropriate and efficient irrigation is made available to support the optimal and sustainable use of irrigable land.
3. Cost-effective hydropower is developed in a sustainable manner.
4. Economic use of water by industries and water bodies through tourism, fisheries, and navigation is optimized.

⁹ The year 2050 refers to the Nepali calendar year in which the Rule was promulgated, the Gregorian calendar is shown in parenthesis.

Mechanisms:

1. Enhanced water-related information systems are made functional.
2. Appropriate legal frameworks are made functional.
3. Regional cooperation for substantial mutual benefits is achieved.
4. Appropriate institutional mechanisms for water sector management are made functional.

This strategy set the background for the National Water Plan, released in 2005, and paved the way for holistic planning in the water sector. The strategy correctly recognized the necessity of multi-stakeholder consultation in the formulation process and the need to address multiple uses and requirements of water. It was a timely look at the multidimensional facet of water resources and is still the official strategy document underpinning most government programs.

3.1.3 National Water Plan 2005

The National Water Plan 2005 (WECS, 2005) built upon the broad objectives of the strategy and adopted the overall national goals of economic development, poverty alleviation, food security, public health and safety, decent standards of living for the people, and protection of the natural environment. The plan included short- medium- and long-term action plans for the water resources sector identifying activities for each time horizon and the associated fiscal and institutional requirements.

The National Water Plan set long-term targets for 2027. But the envisaged activities and programs have not been fully started, and therefore, the plan's goal is far from close to being achieved.

The Water Plan in the irrigation sector had targeted that the area developed as a percentage of the potential irrigable area would be 71, 85, and 97 for 2007, 2017, and 2027 respectively. The current estimate (IMP, 2019) is about 48%, a reduced achievement since the potential irrigable area has been revised and increased to 2.265 million hectares from the then (2002) estimated 1.76 million hectares. This would revise the current irrigation development to only about 62%, while the target for 2017 was set at 85%. Other targets using other indicators in the irrigation sector, such as cropping intensity, crop yield, irrigation efficiency, crop diversification, irrigation service fee recovery, etc., have fallen a long way.

Similarly, the target for the hydropower sector set the hydropower production capacity to be 700 MW in 2007, 2,100 MW in 2017, and 4,000 MW in 2027 to meet domestic demand and sell to the neighboring country if in excess. The current installed capacity is only 1247.51 MW from 107 hydropower plants (DoED website, accessed on 5th March 2021). The actual production is lesser than that.

Furthermore, the water plan had identified certain enabling areas of improvement - legal and institutional frameworks - and these could not be implemented, thus rendering the national plan incomplete. The challenging political scenario with the insurgency and upheavals that followed pushed the focus away from water into general governance, repeated elections, and the formation of the new constitution in 2015.

One important positive thing that has happened is that the Plan set off a series of motions to revamp the legal and institutional aspects of water and put water resources on the mainstream agenda of the public. It set the ground for accepting integrated water resources management approaches as the key to water resources management and drafting a new Water Resources Policy and Bill to redefine the government's approach and revise the older Water Resources Act 1992.

3.1.4 Water Resources Act 1992

Nepal's existing legal framework for water resources management is still set out in the Water Resources Act, 2049 (1992), as completed by the Water Resources Rules, 2050 (1993). Efforts to replace the Act with a newer one in line with the National Water Plan 2005 and the subsequent

new Constitution of Nepal have not been successful to date. This Water Resources Act comprises 25 sections. The primary features of the Act are:

- The ownership of water resources in the vests with the State (nation);
- It provides that, with certain exceptions, all uses of water resources may only be lawfully undertaken on the basis of a license;
- Provides for the establishment of Water User's Associations as legal entities;
- Sets a priority order for the use of water (not based on economics or loss and benefit analyses);
- Contains provisions on survey and utilization licenses on water, while providing licenses for hydro-power are issued on the basis of the Electricity Act (conflicting provisions);
- Provides that the Government may develop or use water resources without a license and that it may transfer projects to water user associations in ownership;
- States that contracts may be concluded for water supply and that license holders may provide services from water resources development in return for payment;
- Contains provisions on entry into premises and land acquisition;
- Confers powers upon the Government to decide for the security of structures, to establish standards for water resources for different uses, and binding pollution tolerance limits;
- States that the use of water resources shall not cause substantial adverse effects on the environment;
- Provides for the cancellation of licenses, if required or warranted;
- Sets out penalties and provisions for appeals; and
- Confers broad rule (regulation) making powers upon the Government.

The provisions of the Water Resources Act are further developed in the Water Resources Rules, which contain some 40 rules on such matters as water user associations, District Water Resources Committees, licensing and licensing procedures, dispute resolution, water resources use fees (for commercial purposes), land acquisition and miscellaneous matters.

The priority uses as per the Act are listed below in terms of priority,

1. Drinking water and domestic uses;
2. Irrigation;
3. Agricultural uses such as animal husbandry and fisheries;
4. Hydroelectricity;
5. Cottage industry, industrial enterprises, and mining uses,
6. Navigation;
7. Recreational uses; and
8. Other uses.

At the date of its adoption, the Water Resources Act was a sound piece of legislation. Indeed, it is still far in advance of water legislation in neighboring countries. The idea of introducing a licensing regime for the use of water resources was certainly correct. However, it is unclear how many licenses have been issued based on this Water Resources Act itself and not through the Electricity Act. This is because government schemes are exempted from the licensing requirements, and both drinking water and irrigation water user associations do not need to hold licenses (either because they are exempt or because they operate government-built schemes that have been transferred to them).

There is also a question mark regarding the desirability of licensing hydropower projects based on a different act, i.e., the Electricity Act.

It is clear that since its adoption, the Water Resources Act has become outdated and needs reform. In particular, it does not provide a sufficient basis for implementing IWRM in that it makes no provision for river basin management planning or institutions or the setting of minimum/environmental flows. Moreover, experience clearly shows that attempting to address water pollution based on standards alone, in other words, without making provision for site-specific wastewater discharge licenses, is inadequate and unworkable.

The Act does not provide for customary rights of fishermen who are traditional fishermen and whose livelihoods are dependent upon fishing. Instead, it makes them illegal if they do not have licenses. Also, there is a provision permitting the licensee to sell the license. This may promote the risk of license brokering rather than advancing the beneficial use of water resources. The regulatory framework should therefore be amended to discourage license brokering.

A key reason why the Water Resources Act needs to be substantially reformed is that it predates and therefore does not consider the new Constitution.

3.1.5 Water Resources Bill 2020

The government has drafted a revised Water Resources Bill 2020 to repeal and replace the existing Act. This Bill is under review by the government. A primary issue that has been contentious is the authority, responsibility, and liability regarding the ownership of water resources. Like the previous Water Resources Act, the Bill says that the ownership lies with the State (the nation). The Constitution says that the water bodies will be owned at the Federal, Province, and local levels as specified.

Nonetheless, it was seen that this Bill is important in terms of the acceptance and adoption of the river basin approach in the development and formation of river basin offices as well as adhering to the principles of IWRM and states the strengthening of the Water Energy Secretariat and having these basin offices as their field offices. Questions may be raised on why the office that prepared the Bill proposes increasing its work areas and authority.

3.1.6 Water Resources Policy 2020

The Government of Nepal recently, in December 2020, released the new Water Resources Policy, which has adopted the principles of IWRM and the river basin organizations to advance the management of water resources. The goal of this new policy is “to sustainably conserve, manage and to carry out multipurpose development of the available water resources contributing to the economic prosperity and social transformation of the country.”

The Policy targets 7 objectives include the following:

1. To judiciously use water resources to fulfill multisectoral demands with ease
2. Contribute to enhanced productivity of the nation
3. To make science and fact-based decisions
4. Ensure a coordinated effort amongst the State, provinces, and local levels
5. Fulfill citizen demands of water and water-related products
6. To develop the water resources with minimal negative impact to the environment
7. Reduce water-induced disasters and related risks

The Policy has further specified 11 working strategies to achieve these targets and the goal. Action plans further describe each strategy. The strategies are briefly stated as (unofficial translations):

1. Water resource utilization and management shall be done on the basis of a river basin master plan.
2. IWRM and multipurpose uses shall be given priority in developing and managing water resources
3. Suitable institutions shall be developed for conservation, development, management, and regulation of water resources.
4. The participation of related stakeholders and the private sector shall be encouraged and increased for the conservation and development of water resources.
5. Study and research in the water sector shall be increased with assimilation of knowledge and data, analysis, and uses of them.
6. Institutions and human resources in the sector shall be further developed.
7. The roles and responsibilities of the federation, provinces, and the local municipalities shall be clearly laid out for coordinated effort in water resources development.
8. The water resource project affected areas and people shall be cared for and protected.
9. The basic necessities of the people of the project area in terms of energy, drinking water, and irrigation benefits shall be awarded with ease and accessible to them on the principles of equity.
10. The water resources shall be developed by minimizing the negative impacts on society, culture, and the environment.
11. Watershed or basin management shall be made effective with control and reduction of water-induced disasters and risk reduction.

Therefore, Nepal's new water resource policy seems to adequately incorporate IWRM principles and adopt the basin as a unit of water administration. It is said that action plans describing the strategic plans, water accounting, allocation, and auditing shall be done with the adoption of river basin plans. It describes a science and fact-based approach to planning and management.

There remains a difficulty, as it has not spelled out in clarity the roles and responsibilities of all the tiers of the government – federal, provincial, and local – that may pose problems and raise concerns.

3.1.7 Irrigation Policy 2013 and new Irrigation Policy 2023

The Government of Nepal's strategy for irrigation development and management is built upon the Water Resources Strategy (2002), National Water Plan (2005), Irrigation Development Vision and Action Plan (2006), and recently, the Irrigation Policy (2013). The main vision described in these documents is to integrate agriculture and irrigation development to realize the full benefits of investment in irrigation and provide sustainable services to the agriculture sector through well-operating irrigation facilities based on local resource mobilization through a partnership of the users and the government.

The objective of the Irrigation Policy is for the fulfillment of the following:

- To provide round the year irrigation facility to the irrigation suitable land by effective utilization of the current water resources of the country.
- To develop the institutional capability of Water Users for sustainable management of the existing system.
- To enhance the knowledge, skill, and institutional working capability of technical human resources, water users, and non-governmental associations/organizations relating to the development of the irrigation sector There is an emphasis on:
 - » provision of year-round irrigation services to increase the productivity of irrigated agriculture and extending the cropping seasons;

- » the need for a service-oriented management approach as a means for providing more reliable and flexible water services to farmers; and
- » the progressive shifting of operation and maintenance (O&M) costs to water users to enhance efficiency, equity, and sustainability.

The Irrigation Policy 2013 predates the new Constitution of Nepal 2015, and it has been revised recently to incorporate direction and essence of federalism, amongst other aspects. The new Irrigation Policy is not yet released, but it has been reported by government officials at various forums and discussions that its objectives include:

- To optimally utilize available water resources in sustainably develop the irrigation sector increasing its coverage for enhanced agriculture production and productivity.
- To provide adequate and reliable irrigation services by implementing effective water management practices supported by construction of irrigation infrastructures, good maintenance and modernizations of systems.
- To provide year-round reliable irrigation services prioritizing multipurpose, storage, and inter-basin transfer, groundwater, and new-technology based projects including conjunctive uses of surface water and groundwater sources.
- To adopt climate resilient and climate change adaptative irrigation infrastructures and management systems.
- To implement a balanced development approach throughout the nation with mutual cooperation and collaboration among the Government of Nepal, Provincial Governments and the local levels.

The new policy is stressing on service delivery and recovery of irrigation service fees, establishing an Irrigation Development Board, seeking alternative investments in the sector promoting private sector involvement, restrictions on conversion of irrigated agricultural lands under command area of a system to other non-agricultural usages, and is generally considered to be more climate responsive.

3.1.8 National Climate Change Policy 2019

The National Climate Change Policy 2019 supersedes the old Climate Change Policy 2011. The Policy states regarding water resources and energy that energy security will be ensured by promoting multiple uses of water resources and producing low-carbon energy.

The Policy says that the following strategies and working policies shall be adopted:

- Technologies for storage, multiple-use, and efficient use of water will be developed and promoted in risk-prone areas and settlements considering the effects of climate change on the availability of, and access to water.
- Rainwater harvesting ponds will be constructed for groundwater recharge and their multiple uses.
- Standards will be developed and implemented for the sustainable use of groundwater resources in urban areas.
- Production and use of renewable energy and use of energy-efficient technologies will be encouraged.
- Selection of environment-friendly sites will be made, and climate-friendly technologies will be used while constructing infrastructures, including that of hydroelectricity, drinking water, and irrigation.
- Measures to mitigate adverse impacts on river ecosystems will be adopted while generating hydroelectricity.

- Risks of glacial lake outburst floods shall be minimized by reducing water level in the lakes by draining them safely.
- Dissemination of information relating to weather will be improved by expanding weather stations in various geographical regions, and their capacity will be enhanced.

Concerning irrigation, it states that water-efficient irrigation technology will be promoted, and project designs will ensure selection of environment-friendly sites. Climate-friendly technologies shall be adopted while constructing infrastructures, including hydroelectricity, drinking water, and irrigation.

The policy is relatively new and has been heralded as a landmark in the Nepalese policy context regarding the success with which a subject spanning multiple agencies and institutions was collectively addressed. However, effective implementation and enforcement of the policy with actionable plans, clear roles and responsibilities, and ownership across different government agencies are lacking. Integration of the policies and mainstreaming across different sectors and governance levels remain challenging and below par to date. Other ministries and provincial governments appear disinterested and shelve the climate agenda to the responsibility of a division at MOFE, demonstrating a lack of ownership and motivation. The capacity to enforce the policy is severely limited at federal, provincial, and local levels of governance.

Financing climate action has been a sore issue as the country requires huge amounts to fund these planned actions. Innovative international funding mechanisms are cumbersome and require hard work and expertise. Research and knowledge sharing are also limited coupled with inadequate monitoring and evaluation mechanisms of policy implementation.

3.1.9 Irrigation Master Plan 2019

The Department of Water Resources and Irrigation has developed an Irrigation Masterplan following the Master Plan of 1990 to develop a long-term strategy for developing the irrigation sector based on the available resources and policies and implement an investment program that is consistent with the strategy. This new Master Plan, though not yet approved by the government, has prioritized research and development areas and also include the following:

- Mainstreaming climate change adaptation in irrigation planning and management
- Sustainable storage development in the Greater Himalayan Region

It is important to note that the Master Plan identifies the possibility of utilizing water storage capacity in the Greater Himalayan region for adaptation to climate change. It may be possible to harness the natural systems in the biosphere through initiatives such as wetlands conservation and improved watershed management in the hills and mountains, as well as groundwater aquifer recharge in the foothills. Small ponds and tanks for rainwater harvesting could also be built on hill farms and around hill communities. The construction of large dammed reservoirs on the downstream plains is a further option and has been carefully considered in this Irrigation Master Plan. It also states that the knowledge gap concerning such sustainable water storage will have to be addressed through fresh research studies.

The Master Plan has not yet been endorsed officially by the government. It is reported that there are inherent flaws in the prioritization of schemes, delineation of irrigable areas, and focus being mainly on large diversion structures. The funding capacity to undertake these diversions, the proposed timeframes, and the capacity to implement them remain questionable.

3.1.10 Agricultural Development Strategy 2015

The irrigation sector is intrinsically linked with the agriculture sector as it is one of the inputs to enhance agriculture productivity. This is a long-term agricultural sector strategy, 2015-2035. The vision of the Agricultural Development Strategy (ADS) has been stated as a self-reliant, sustainable, competitive, and inclusive agriculture sector that contributes to economic growth, improved livelihood, and food and nutrition security. ADS emphasized promoting self-sufficiency in food grains

and import substitution in a number of commodities where the country has the potential to grow. It seeks to increase coverage of year-round irrigation from 18% (in 2010) to 30% in the short term (5 years), 60% in the medium term (10 years), and 80% in the long term (20 years).

3.1.11 Hydropower Environmental Impact Assessment Manual 2018

MOFE, in consultation with relevant line agencies and ministries, has issued a comprehensive EIA Manual that dictates the minimum standards, administrative systems, processes, and templates to be followed during an EIA for any qualifying project.

Under the scoping exercise, the manual prescribes that information on local-scale climate change projections and resilience are required when describing the physical and chemical environment. Chapter 7, on identifying existing conditions, recommends including climate change projections, from the Intergovernmental Panel on Climate Change, regional and national agencies or organizations, in the assessment of existing climate conditions on-site to determine any potential effects throughout the duration of hydropower operations. The use of appropriate tools to carry out climate risk screening, including information on evaporation and evapotranspiration, is recommended. It also states that baseline information on weather and climate will be used in hydrological flow modeling that will be used to assess impacts on changes in instream flows.

Chapter 8 describes relevant climate change impacts generated through different types of hydropower project lifecycles regarding greenhouse gas emissions. It describes the possible sources of greenhouse gases depending on the type of hydropower project, which may include loss or decomposition of submerged vegetation, combustion of fuels in vehicles and other machinery, etc. It requires the EIA process to discuss what impacts greenhouse gas emissions and loss of carbon storage through vegetation clearing and/or soil degradation will occur during the construction and operation of the hydropower plants.

Appendix C of the guideline requires that emergency preparedness and response protocols for disaster risk reduction and climate change adaptation are to be prepared. It suggests these may be required concerning flow diversion, intake, reservoir or pondage, and sediment flushing mechanisms.

In light of the above, it must be stressed that the manual is short in considering cumulative impacts and focuses on individual stand-alone projects. Climate change assessments with adaptation and resilience strategies are often overlooked, as well as the provision of ecosystem services, and this often becomes a mechanistic approach that does not foster active participation and integration of environmental impacts and assessments.

3.1.12 Guidelines in the Hydropower Development Sector

There are a number of guidelines in the development of the hydropower sector. These are:

- Guidelines for Study of Hydropower Projects 2003
- Guidelines for Water Conveyance System, DOED 2006
- Guidelines for Power System Optimization of Hydropower Projects, DOED 2015
- Guidelines for Operation and Maintenance of Hydropower Plants, Substations and Transmission Lines, DOED 2017
- Design Guidelines for Headworks, DOED 2018.

None of these guidelines directly discuss climate change and how climate change information is to be integrated into project formulation, design, and operation stages. Furthermore, provisions of environmental flows, environmental and social safeguards, and monitoring and evaluation mechanisms need improvements.

3.1.13 Guidelines and Manuals in the Irrigation and Water Resources Sector

The design guidelines and manuals in the irrigation sector were developed in the 1990s and are known as the PDSP manual (UNDP NEP 85/103/World Bank -1990) used by the Department of Irrigation and are the main design manual used apart from standard textbooks. The procedures could likely be improved, and it is recommended that there is a comprehensive review of the methods for designing irrigation structures.

Irrigation design must evolve to include large-scale projects, basin-diversion schemes, tunneling, and construction of dams. It must also specify design criteria and methodology for designing the irrigation sector's hydraulic structures, embankments, and even hydro-mechanical components. Information on how to incorporate climate change methods must be specifically described so that the design engineers can qualitatively incorporate and mainstream climate change into irrigation projects.

3.2 Other Policies, Acts, Rules, and Orders

The major water resources policies and legal documents are discussed above. Since water is an essential part of personal livelihood in particular and society in general, other sectoral legal instruments have some bearing on the utilization and management of water resources. These range from encouraging private participation in the development process, such as the Public-Private Partnership Policy to Public-Private Partnership and Investment Act 2019, to regulatory policies and guidelines on environmental protection, land acquisition, etc. These are listed below and summarily described in Annex A.

Policies

- The Hydropower Development Policy 2001
- Forest Policy 1993
- Climate Change Policy 2011 (old policy)
- Land Use Policy 2015
- Rural Energy Policy 2004
- Rural water supply and Sanitation National Policy 2004
- National Agriculture Policy 2004
- Water-induced Disaster Management Policy 2015
- Land Acquisition, Resettlement, and Rehabilitation Policy 2015
- Public-Private Partnership Policy 2015

Acts

- Aquatic Protection Act 2017
- Civil Code 2017
- Criminal Code 2017
- Consumer Protection Act 1999
- Development Board Act 1956
- Disaster Risk Reduction and Management Act 2017
- Electricity Act 1992
- Electricity Theft Control Act 2002
- Environment Protection Act 1997

- Essential Commodity Protection Act 1955
- Foreign Investment and Technology Transfer Act 1992
- Forest Act 1993
- Inter-Governmental Fiscal Management Act 2017
- Investment Board Act 2010
- Industrial Enterprises Act 1992
- Land Acquisition Act 1977
- Land Revenue Act 1978
- Local Government Operation Act 2017
- Natural Resources and Fiscal Commission 2017
- Nepal Electricity Authority Act 1984
- Nepal Water Supply Corporation Act 1989
- Public-Private Partnership and Investment Act 2019
- Ship Registration Act 1971
- Water Supply Management Board Act 2006
- Water Supply Tariff Fixation Commission Act 2006
- Water Tax Act 1966
- Nepal Electricity Regulatory Commission Act 2017
- Irrigation Act (draft Bill) 2015
- Draft Water Resources Act (Bill)-

Rules

- Drinking Water Rules 1998
- Drinking Water Service Charge (Recovery) Rules 1994
- Drinking Water Service Operation Directive 2012
- EIA/IEE Working Procedure for Hydropower and Transmission Lines 2016
- Electricity Leakage Control Rules 2002
- Electricity Rules 1993
- Electricity Tariff Fixation Rules 1994
- Environment Protection Rules 1997
- Guidelines for Study for Hydropower Projects 2003
- Irrigation Rule 2000
- National Drinking Water Quality Standard 2005
- National EIA Guideline 1993
- Pesticide Rule 1994
- Rafting Rule 2006
- Solid Waste Management Rules 2013
- Water Resources Rule 1993

Treaties and bi-lateral Minutes

- Agreement between the Government of Nepal and the Government of India on the Gandak Irrigation and Power Project 1959
- Treaty Between the Government of Nepal and the Government of India concerning the Integrated Development of the Mahakali Barrage, Including Sarada Barrage, Tanakpur Barrage, and Pancheshwar Project 1996
- Revised Agreement between the Government of Nepal and the Government of India on The Koshi Project 1975

Orders

- Formation order of Groundwater Resources Development Board 1975
- Formation Order of Water and Energy Commission 1992
- Formation order of Rural Drinking Water and Sanitation Fund 1996
- Formation Order on reformation of National Water Resources Development Council 1997
- Formation Order of Melamchi Drinking Water Committee 1998
- Formation order of Electricity Development Committee Fund 2002

Furthermore, Public-Private Partnership Investment Act, Inter-Governmental Fiscal Management Act, Nepal Electricity Regulatory Commission Act, Land Acquisition Act, Local Government Operation Act and Proposed Drafts on IWRM-related provincial laws, Water Resources Act, National Priority Project Act, Draft Forest Act, Draft Environment Act, Draft Land Use Act may also impact to some extent the utilization and development of water resources and related projects.

It should be noted that it is often said that the water resources sector and the related aspects of developing it with projects is a highly regulated system with one of the highest numbers of Acts, rules, and regulations to follow, such that the water projects always require more time to complete than normally envisaged. This also overruns the project costs. Addressing this aspect, the Investment Board Act 2010 was passed, and the Investment Board was formed to fast-track large projects and help ease foreign direct investment.

The policies and acts, in general, are geared toward surface water irrigation, and the aspect of groundwater irrigation is often lacking. It is clear that groundwater is increasingly being compromised, whether through over-extraction, aquifers contamination, or degradation of recharge areas. There is no clear mechanism to regulate it to date, despite it being recognized as a major water source for consumptive use and expediting irrigation coverage. New technologies in energy for driving the pumps, primarily solar, are also increasingly used for isolated tube-well irrigation.

3.3 Provincial Water Policies and Laws

Nepal includes seven Provinces and local governing bodies. The local bodies total 753 bodies, including six metropolises, 11 sub-metropolises, 276 municipal councils, and 460 village councils. The provinces have their own legislative body and executive offices.

The provinces have responsibilities for water resources development, but the laws and regulations to enable them are still being formed and carried over from the national laws and policies. The existing scenario is that the federal or existing laws are carried on as inherited laws and assumed applicable unless the governing body deems it necessary to formulate its own policies and laws.

Province 1 has promulgated the Provincial Electricity Act 2019, while the legislation did not pass the Irrigation Bill and remains a Bill. Province 2 has promulgated the Provincial Act related to Electricity, 2020, while the Sudurpaschhim Province has passed the Environment Protection Act 2019. These are promising signs of the provinces attempting to make their own decision.

The proposed Irrigation Bill of Province 1 had provisioned provincial jurisdiction for irrigation in terms of size or command area. Irrigation projects within 200 to 20,000 ha in the Terai and 50 to 1,000 ha in the hills/mountains were proposed under provincial jurisdiction.

One of the prime areas for which the province and local level governments are at contention is the mining of sand, aggregates, and rocks for construction materials. This is often viewed as a lucrative business and income for the local level municipalities, and often the rivers, riverbanks, and hillsides are indiscriminately mined without regard to the effect it has on the hydrology, morphology, and even danger to the built infrastructures. Climate change extremes further compound these risks.

Defining relationships between the three tiers of government in terms of their authority, liabilities, and responsibilities is an area that requires urgent attention. The legal definitions of their respective areas must be clearly stated without duplicating and rapidly removing confusion. This is an area for policymakers and the stakeholders to come together and solve now.

3.4 Transboundary Water Policy and Law

Nepal has a significant history of transboundary water-sharing agreements with India, including the 1954 Koshi Project Agreement, the 1959 Gandak Agreement, and The Mahakali Treaty of 1996. There is no specifically spelled-out policy instrument regarding transboundary waters. Nepal also has not entered into treaties or understandings with China on any of the rivers flowing into Nepal from China.

Nepal's recent stance has been, with India, and spelled out in a number of bilateral forums, that the cost of and benefits of any development must be shared between both parties equitably. The development of reservoirs would render large tracts of fertile farms, forests, and villages/infrastructure underwater, incurring huge economic, social, and environmental costs to Nepal. At the same time, there would be augmented flow in the rivers flowing downstream, benefitting India in enhancing its crop yield through the higher intensity of irrigation and benefits from floods due to regulated waters.

Transboundary water treaty practice has developed considerably internationally over the past four decades. Of particular note is The Convention on the Law of Non-Navigational Uses of International Watercourses, commonly called the UN Watercourses Convention. This entered into force globally in 2014 and has been undertaken since 1997 to attract the requisite number of ratifications from the member countries.

The UN Watercourses Convention has codified a number of principles of international law concerning the obligations of nations that share watercourses, and these include:

- Article 5: Equitable and reasonable utilization and participation
- Article 7: Obligation not to cause significant harm
- Article 8: General obligation to cooperate
- Article 9: Regular exchange of data

It should be noted that the historic notion of absolute territorial integrity (also called the Harmon Doctrine) – in which a country can choose to utilize the water flowing through its territory in its entirety and without any concern for its co-riparian countries has completely failed to gain traction as a principle of transboundary water law. What has come to the fore in modern transboundary water law is the principle of achieving equitable and reasonable utilization by all the riparian countries of an international watercourse – which requires those countries to agree to a shared working apportionment of the available water. This has therefore superseded notions that a downstream state can require an upstream state to fix flows in perpetuity based upon some earlier historic flow rate. Clearly to do so would be to restrict the potential for development in the upstream state. Examples of such strong tactics to stop upstream development have definitely occurred worldwide and in the region.

In the context of transboundary water sharing between Nepal and India, there is enormous scope for beneficial cooperation. Nepal has water resources but has neither the market for the product nor the economy that can sustain investing on a large scale.

India has a well-developed economy that can make large investments as well as the market to consume the product, i.e., electricity, but it does not have the water resource. The growing economy needs sustainable energy sources, hydropower, and sustained flows important for irrigation of the dry farmlands, drinking water supplies, and protection from floods. Nepal could also benefit from navigational access to India's major waterways and feels that avenues to fund the development could be agreed to if the avoided costs of flooding and benefits of sustained flows are quantified and attributable to Nepal so that adequate compensations for the areas submerged or acquired for water projects can be duly made. There may therefore be merit in considering developing a combined water and benefit-sharing framework agreement first to get the cooperation rolling.

A number of bilateral, trilateral, and regional efforts are ongoing to foster cooperation and streamline concerted efforts. The bilateral cooperation mechanisms are through joint committees at various levels. These have often become merely functional, such as the SAARC initiatives or the efforts to get a trilateral (Bangladesh, India, and Nepal) committee for water resources cooperation. The World Bank and the Government of India funded the Ganges Strategic Basin Assessment report (World Bank, 2014), on the other hand, states that the significance and role of storage projects in downstream flood protection and flow augmentation are not clear, so the cooperation for hydropower development should go ahead on a fast track as it promises better benefits.

3.5 Institutional Structure and Coordination Mechanism for Water Governance

The institutional structure and the coordination mechanism are being redefined to some extent after the promulgation of the new constitution and could be divided into four categories (Kumar et al., 2016). These are:

1. Policy/planning and coordinating bodies,
2. Sectoral policy and planning and programming organizations,
3. Regulatory bodies,
4. Service providers with autonomous nature, including local governance bodies.

3.5.1 Policy Planning and Coordinating Bodies

In Nepal, if one analyses the legal documents and recollects the recent history, there are high-level policy and planning bodies, either sectoral specific or overall national level. These are:

1. National Planning Commission (NPC),
2. National Development Council (NDC),
3. Investment Board Nepal (IBN),
4. Environment Protection Council (EPC),
5. National Water Resources Development Council (NWRDC),
6. Water and Energy Commission (WEC).

The NPC and the NDC are general national policy formulating and planning bodies, while the IBN is more geared towards promoting direct international investments into large projects in Nepal. EPC is an environment-related council that will influence water and water-related development. The NWRDC and the WEC are directly related to water and are authorized to carry out policy planning and other related studies. The Water and Energy Commission (WEC) was established by GoN in 1975 to develop water and energy resources in an integrated and accelerated manner. Consequently, a permanent secretariat of WEC was established in 1981 and was given the name Water and Energy Commission

Secretariat (WECS). The primary responsibility of WECS is to assist the Government of Nepal, different ministries related to water resources, and other relating agencies in formulating policies and planning projects in the water resources sector.

A Government Secretary and other bureaucrats lead the WEC and its secretariat. WECS led the Water Resources Strategy (2002) formulation and the National Water Plan (2015) preparation and is carrying out activities as a think tank and a policy organization. The NWRDC has rarely convened and is inactive.

3.5.2 Sectoral Policy and Planning and Programming Organizations

Some sector-specific ministries are specifically designated to carry out activities related to that sector. These offices carry out sectoral policy and planning activities, program development, and implementation. The implementation activities may be done through its subsidiary organizations, usually the departments. These ministries are:

1. Ministry of Agriculture and Livestock Development
2. Ministry of Energy, Water Resources and Irrigation
3. Ministry of Federal Affairs and General Administration
4. Ministry of Forest and Environment
5. Ministry of Water Supply

The Ministries' activities or subject purview are self-evident from their names. The departments under these ministries that carry out the relevant works throughout the nation or through their field offices and project offices are:

1. Department of Agriculture
2. Department of Electricity Development
3. Department of Water Resources and Irrigation
4. Department of Hydrology and Meteorology
5. Department of Local Infrastructure
6. Department of Forest and Soil Conservation
7. Department of Environment
8. Water Resource Research and Development Centre (WRRDC)

Furthermore, all provinces carry out province-level development activities, and the local bodies (municipalities) also implement their own programs.

3.5.3 Regulatory Bodies

1. Electricity Tariff Fixation Commission (ETFC)
2. Drinking Water Tariff Fixation Commission (DWTFC)

3.5.4 Service Providing Autonomous Bodies and Local Governance Bodies

1. Nepal Electricity Authority (NEA)
2. Ground Water Development Board
3. Municipalities (urban, rural, and various metropolises)

3.6 Provincial-Level Institutions

The new constitution's federal setup has provided for 7 Provinces. The provinces from east to west are Kosi Province (Province 1), Madhesh Province (Province 2), Bagmati Province (previously called

Province 3), Gandaki Province (previously called Province 4), Lumbini Province (previously called Province 5), Karnali Province (previously called Province 6), and Sudurpaschim Province (previously called Province 7).

The Provinces have their unicameral provincial assembly (Pradesh Sabha), which elects the executive Chief Minister of the province. The following institutional structures listed below exist in the provinces depending upon the governments and bifurcation of ministries at times.

1. Office of the Chief Minister and Council of Ministers
2. Provincial Policy and Planning Commission
3. Ministry of Economic Affairs and Planning (MOEAP)
4. Ministry of Internal Affairs and Law (MOIAL)
5. Ministry of Industry, Tourism, Forestry and Environment Committee (MOITFE)
6. Ministry of Land Management, Agriculture and Cooperatives (MOLMAC)
7. Ministry of Physical Infrastructure Development (MOPID)
8. Ministry of Social Development (MOSD)
9. Ministry of Water Supply, Energy, and Water Resources

A review of the institutional system at the provincial level shows that the water sector activities are executed by either the Ministry of Water Supply and Water Resources or the Ministry of Physical Infrastructure Development (MOPID). At the same time, the Provincial Policy and Planning Commission considers the overall multisectoral planning. Climate Change Division is located within the Provincial Ministry of Industry, Tourism, Forest, and Environment, while agriculture is looked over by another branch - the Ministry of Land Management, Agriculture and Cooperatives (MOLMAC).

The country continues to face regional, urban-rural, and social disparities, despite policies and efforts directed toward it. Poverty in rural areas, inhabited by 81% of the population in 2011, was almost twice as high as in urban areas. The far-western region, presently the Sudur Paschim Province (Province 7), and the hill regions of western Nepal are more disadvantaged in terms of access to government resources and development efforts. Poverty in socially disadvantaged groups such as Dalits, Madhesis, Muslims, and indigenous Janajatis is significantly higher than the national average.

Adopting the IWRM approach in water resource development and management could be an important way to develop participation and enhance equity in the access and development process across regions and different sectors of society. This would enable the developing capacity to face adverse situations, recover and rebound from shocks indicating higher resilience.

It was found that the relationships between the provinces and the federal offices are often determined more by personal relationships rather than vertical integration.

3.7 Water Sector Stakeholder Map

The above listing of the government institutions and bodies and the various boards and commissions represent the larger group of stakeholders from the government sector. Of these, the primary stakeholders whose areas are directly and actively related to policy, planning, and implementation of water sector activities are:

1. Ministry of Energy, Water Resources and Irrigation
2. Water and Energy Commission Secretariat
3. Department of Water Resources and Irrigation
4. Department of Hydrology and Meteorology
5. Department of Electricity Development

6. Water Resources Research and Development Center

The activities and works carried out are evident in the organizations' names. The ministry is the overall executive office of the government that is exclusively involved in policy formulation, planning, program implementation, monitoring, and evaluation in the water sector. The Ministry devolves some of its power to the departments or subsidiary organizations for program implementation and feedback. These are responsible for federal-level programs.

The Water Energy Commission Secretariat is, as described before, is sort of a "think tank" for formulating policies and planning projects in the water resources sector, with the recent introduction of the Water Resources Policy and the proposed Water Resources Act that are under consideration at the house, the role of WECS is going to be even bigger as the custodian of the river basin information and all data related to water resources planning, allocation and monitoring usage in the basin. It will also develop as the clearinghouse for all related projects that eventually require water or discharge into water bodies.

Institutional mechanisms to foster vertical linkages across three-tiers of governance are desirable, as one of the stated issues is that the province governments do not know what the federal agency is doing. It only becomes evident when the contractor is on site. This also enhances the likelihood of duplicity.

4. STATUS OF ADAPTATION ACTIONS IN WATER SECTOR

To address the effects of climate change, the Government of Nepal has prepared its National and Local Adaptation Program of Action (NAPA and LAPA). These documents identify different priority actions and recognize the need for local-level adaptation. The government has initiated adaptation plans, but implementation has remained challenging. For example, in some municipalities for whom the adaptation plans were developed, even the elected officials were unaware of them. Furthermore, the LAPA that was earlier developed in some municipalities needs to be redone as the local municipalities changed and became larger with the advent of federalism in Nepal.

4.1 National Adaptation Plan

Nepal is yet to finalize the National Adaptation Plan formally and has not submitted the National Adaptation Plan yet. The National Adaptation Plan (NAP) has reportedly been completed, but the official document has not yet been released. The summary for policy makers has been released (MoFE, 2021), and the main document is still awaited. These documents identify different priority actions and recognize the need for local-level adaptation. Because the NAP was going to take time, Nepal prepared and submitted the National Adaptation Plan of Action to UNFCCC in 2010.

Nepal started its National Adaptation Plan (NAP) process in September 2015. It received, in 2016, the NAP Readiness funding from the Green Climate Fund (GCF) through the support of the UN Environment Programme (UNEP). Vulnerability and Risk Assessment (VRA) framework and indicators were developed in 2017, and the observed climate trend scenarios were prepared. Currently, the vulnerability risk assessments for different thematic sectors are completed.

The NAP preparation process engaged thematic working groups. There were eight thematic areas and four cross-cutting areas, as listed below.

Thematic Areas

1. Agriculture and food security
2. Forests, biodiversity, and watershed conservation
3. Water resources and energy
4. Rural and urban settlements
5. Industry, transport, and physical infrastructure
6. Tourism, natural and cultural heritage
7. Health, drinking water, and sanitation
8. Disaster risk reduction and management

Cross-cutting Areas

1. Gender equality and social inclusion, and livelihoods and governance
2. Awareness raising and capacity development
3. Climate change finance management
4. Research, technology development, and expansion

Nepal intends to identify medium and long-term adaptation needs through this process, including urgent and immediate priorities. Key outputs of NAP, evident in 2021, include the following.

- It will incorporate adaptation and resilience milestones to be achieved in the short-term (by 2025), medium-term (by 2030), and long-term (by 2050).
- The Climate Information System will be established and operationalized by 2025.

- NAP Monitoring, Reviewing, and Reporting Framework will be developed and operationalized by 2022.

The thematic area of the NAP on water resources and energy comprises 19 members, and the coordinator is the Ministry of Energy, Water Resources and Irrigation. It was learned that the group had met only once online and once in a physical meeting and initiated the works of the thematic group. The group recently met to finalize procedures for vulnerability risk assessment, and the NAP sectoral report is yet to be finalized.

As identified earlier, the implementation remains a challenge regarding resource limitations, capacity to understand and implement programs, and ownership issues across agencies. Access to international funding mechanisms and navigating the complex processes to apply for funds requires specialized service, and this is hampering Nepal. Furthermore, horizontal and vertical coordination among and across agencies, including governing levels, remains a huge obstacle.

4.2 Local Action Plan for Adaptation

The Government of Nepal submitted to the UNFCCC the national framework on Local Adaptation Plans for Action (LAPAs) to strengthen and implement their NAPA-prioritized adaptation actions. The Government of Nepal (GoN) endorsed the National Climate Change Policy in 2011, which supported the NAPA and LAPA implementation. A major highlight of the policy is that it proposed a bottoms-up approach earmarking to “allocate at least 80% of available funds for field-level climate change activities.”

The LAPA process ensures “direct participation of the climate-vulnerable communities in identification, prioritization, planning, implementation, and monitoring of adaptation actions. “LAPA framework 2011 was developed for localizing adaptation actions and ensuring funds for local-level activities for LAPA. The seven steps of LAPA are:

- STEP 1. Sensitization,
- STEP 2. Vulnerability & Adaptation Assessment,
- STEP 3. Prioritization of Adaptation Options,
- STEP 4. Adaptation Plan Development,
- STEP 5. Integrating the Adaptation Plan,
- STEP 6. Implementing Adaptation Plan, and
- STEP 7. Assessing Progress

It is reported that more than 100 LAPAs were carried out in several selected districts that scored high on the vulnerability assessment. Currently, new LAPAs are being prepared and rolled out with international aid.

4.3 Nationally Determined Contributions

Nepal submitted its first Nationally Determined Contributions (NDC) on 5 October 2016, after ratifying the document by the parliament of Nepal on 04 October 2016. The extended NDC was recently submitted on 08 December 2020 (second NDC).

Nepal is committed to acting on climate change in line with the Paris Agreement, despite the country's negligible emissions. It is viewed that efforts should be made to limit the global average temperature rise to 1.5°C as it significantly lower risks for Nepal compared to 2°C or higher. Nepal faces climate risks in addition to the existing impacts and vulnerabilities of climate change. Nepal seeks all Parties to move collectively onto emission reduction pathways consistent with the Paris Agreement's 1.5°C warming limit (GoN, 2020). Nepal's NDC covers adaptation and mitigation actions in response to climate change impacts. The targeted reductions are stated to be contingent upon international support.

4.3.1 Mitigation Targets

The mitigation measures to be adopted include activity-based targets and policy targets in key sectors, including emissions reduction in some sectors. The mitigation component includes energy; Industrial Processes and Product Use (IPPU); Agriculture, Forestry, and Other Land Use (AFOLU); and Waste sectors. The target period is ten years from 01 January 2021 till 31 December 2030, with an update in 5 years in 2025. The details of the mitigation are described meticulously in the NDC itself. The relevant aspects related to the water sector are described below.

Energy Generation

- It targets clean energy generation from approximately 1,400 MW to 15,000 MW, of which 5-10 % will be generated from mini and micro-hydro power, solar, wind, and bio-energy. In this commitment, 5,000 MW is an unconditional target, and the rest depends upon the availability of funding and investments from the international community.
- The commitment also includes ensuring that 15% of the total energy demand is supplied from clean energy sources.

Forestry Sector

- Maintain 45% of the country's total area under forest cover, including other wooded land limited to less than 4% by 2030.
- Manage half the Terai and Inner Terai forests and a quarter of the middle hills and mountain forests sustainably by 2030, using funding from REDD+ initiatives.

Waste

- A target of 380 million liters/day of wastewater is set to be treated before being discharged by 2025, as well as managing 60,000 cubic meters/year of fecal sludge. It is estimated that this will reduce about 258 gigagrams of CO₂ equivalent compared to business as usual.
- The current NDC details the mitigation targets above to facilitate clarity, transparency, and understanding according to protocols.

4.3.2 Adaptation Targets

In the context of adaptation, the NDC primarily covers agriculture and climate-induced disasters. For this, the National Adaptation Plan is being considered. As discussed previously under NAP, Nepal intends to implement medium and long-term adaptation to address needs, including urgent and immediate priorities. Key adaptation timelines are:

- It will incorporate adaptation and resilience milestones to be achieved in the short-term (by 2025), medium-term (by 2030), and long-term (by 2050).
- The Climate Information System will be established and operationalized by 2025.
- NAP Monitoring, Reviewing, and Reporting Framework will be developed and operationalized by 2022.

These adaptation targets and milestones will be stated in the NAP document, which is yet to be released. The third NDC was submitted in June 2021, demonstrating Nepal's commitment to combat climate change impacts. The targets are even more ambitious and will require serious planning and execution.

Nepal's climate action plan is seriously questioned as it makes commitments that are clearly impossible to keep and are often stated as contingent upon international support. The gap between ambition and action is growing wider.

5. INTEGRATION OF CLIMATE ADAPTATION AND RESILIENCE IN WATER POLICIES

The government recently approved the National Water Resources Policy 2077 (2020) to contribute to sustainable and equitable management of water resources by adopting policies to minimize water-induced hazards and negative impacts on economic, social, and environmental aspects. The policy recognizes in the introduction that population growth and climate change will put greater pressure on our water resources. It also recognizes the increased risks from extreme weather. The receding snowline and increasingly melting glaciers are threats to our water supply spurred on by climate change.

It must be noted at the onset that the Water Resources Strategy 2002 and the ensuing National Water Plan 2005 both address environmental issues quite well but do not focus on or address climate change issues (MOFE, 2020). This applies equally to the Water Resources Act of 1992, the Irrigation Policy of 2013, the Electricity Act 1992, etc.

The Water Resources Policy sets to “reduce water-induced disasters and carry out related water risks reduction,” implying the threat of glacier lake outburst floods, landslide-induced floods, as well as droughts and dry spells brought in by climate change.

It is well understood that when one has to deal with the uncertainties of climate change and changing patterns, the best management unit for water is at the basin level. One can prepare water assessments and prepare water budgets amongst different users, including ecosystem requirements, and allocate water as per priority set amongst the stakeholders and as mandated by law. The policy also provides for amending or revising the priority allocations if necessitated with changes in flows affected by climate change. The current National Water Resources Policy expresses these methods of adapting to scarcity.

This National Water Resources Policy 2020 explicitly integrates climate adaptation and resilience activities. The strategic plan under strategy number 10 says that the government will carry out plans and programs for addressing climate change-induced effects and impacts to control or mitigate them.

The Strategy 11 of the policy states that “water-induced disaster shall be controlled or reduced by effective management of the watershed.” This strategy is being taken up through the action plan (number 11), which says that “To reduce the impacts of climate change measures such as the collection of rainwater, construction of storage ponds, drip and sprinkler irrigation, lift irrigation, piped irrigation, tunnel farming and novel practices of artificial rain and virtual water technologies shall be adopted.”

One of the methods of resilience and adaptation is flood zone planning, which is specifically laid out under the same strategy as above, and action plan 12, that flood and inundation mapping for each river shall be carried out to identify risk-prone areas and settlements and construction activities in such areas shall be prohibited. It also talks about national, provincial, and local capacity building.

It is also recognized that the Irrigation Policy 2013 is one of the key policies, strategies, and action plans that open avenues to build adaptive and resilience capacity to address climate change impacts in specific sectors (MOFE, 2020).

The latest policies in the water sector have well-integrated the concepts of adapting to climate change and resilience. These concepts and policy-level statements must be translated into actions with guidelines and standards. Our observations show that this policy translation into real beneficial actions on the ground is slow and difficult to realize in Nepal. The National Water Plan in 2005 set out the direction for making policy changes to the water and related sector championing integrated water resources management. Still, the achievements have been far less than satisfactory. Leadership at the federal and provincial levels is usually diverted to immediate priorities of governance and

activities addressing concerns with more visible and direct benefits rather than changing policies and directives, which may take time to show dividends and meet resistance. Sensitization of issues and greater consultations amongst stakeholders is required on critical topics to energize the bureaucracy to address policy and legal issues that help establish a robust system and have long-term benefits. Therefore, the government ministries and departments need some assistance on these activities to bring them to the forefront for discussion and resolution.

6. KEY FINDINGS

This report has discussed the water resources policies and institutions and a review of the existing policies and strategies preceded by a background discussion on the water resources of Nepal. These key findings will be of especial relevance to the WECS and MoEWRI, the two agencies setting the policy scenario in the water resources sector in Nepal.

The summary of the review of the policies indicates that there are water laws and policies, some predating the current political system and some recently adopted. The older policies do not specifically address climate change aspects, as it was not customary when enacted. These include the Water Resources Act 1992, Water Resources Strategy 2002, National Water Plan 2015, Irrigation Policy 2013, and Electricity Act 1992. These also predate the current political system and are long overdue for revision.

Not streamlining water policies and making timely interventions in terms of implementing them in the IWRM approach and addressing climate change impacts will render the policies obsolete; programs and interventions will start being set on ad hoc bases and ultimately lead to mismanagement, reduced accountability and transparency, and water scarcity. The IWRM approach ensures a holistic approach, including participation, equal access to resources, equity in service delivery, and a science-based data-driven management system. Not including climate change aspects in policy will risk the water sector to increased vulnerability, lack of adaptation measures, and mitigation strategies disrupting water availability and reliability of supplies, impacting ecosystems, agriculture, human health, economic sectors, and livelihood. Access to climate-related funds will also be impossible. Ultimately, failing to address climate change in water policies can have far-reaching consequences for the environment and society.

6.1 OECD Water Governance Framework

The individual policies and other instruments are described briefly in Chapter 3, summarizing their efficacy and performance. The policies are largely aligned with the national goals and development objectives. The following summarizes the findings using the OECD water governance framework (OECD, 2015) for analysis, as shown in Figure 12.

6.1.1 Effectiveness dimension

This relates to clearly defined sustainable water policy goals and targets at all levels of government to implement those policy goals and to meet expected targets.

Roles and responsibilities: The majority of policy and legal instruments adequately set targets or goals, or priorities in their preamble relating it to the larger goals of the nation and set roles and responsibilities of the primary institute enacting the policy. The roles and responsibilities of other horizontally and vertically linked institutions across all levels of governance are mostly absent in Nepal.

Manage water at the appropriate scale: Devolution to provinces and local governments is just starting while the basin organizations align with the proposed Water Resources Bill. Everything to date is managed at the center. Therefore, this principle is not fully met in water policies in Nepal. Traditional farmer-managed irrigation schemes are managed at local scales.

Policy coherence through effective cross-sectoral coordination: This is just starting to be shown in Nepal, for example, with the Climate Change Policy 2019, but water policies generally do not enjoy cross-sectoral cooperation, and policy formulation and implementation are often carried out in silos.

Capacity: The capacity is also limited at all levels of government regarding staffing, budgeting, knowledge, skillsets, and procedural framework. For example, government officials often

know the IWRM concepts, but the concepts of equity, economic efficiency, and sustainability are hardly practiced. A participatory approach is limited to approving individual projects but not utilized in policy formulations, monitoring performance, and evaluation. Guidelines or standards for support are to be made at the earliest possible.

6.1.2 Efficiency Dimensions

This relates to the contribution of governance to maximize the benefits of sustainable water management and welfare at the least cost to society.

Data and information: There is a shortage of verified data to guide, evaluate and monitor policy implementation. Data is considered a product, and departments find it hard to let go and share. The DHM is gradually opening up with data portals, and often, government-related data needs to be looked for elsewhere but in government offices. Geographical information systems in creating a database of irrigation systems, mapping out command area development, and creating systems inventory have caught up. These are promising signs that need to be encouraged and utilized further.

Finance resources: Policies are well-meaning and well-intentioned, aligned with broader national goals and targets. Implementing the policy by funding the policy-dictated activities is difficult. Financial outlays, and budgeting is often non-scientific and severely limited by the scarcity of resources. For example, the funds to sustain NDC actions are absent, and the nation can miss its commitments. The user/polluter pays principle must be enforced and practiced in Nepal with adequate fines to address the lapse. Public private partnerships, cost-recovery systems in public investments such as irrigation fee recovery, payments for eco-system services will need to be explored and strengthened.

Regulatory frameworks: Implementing regulatory frameworks in line with the policies and enabling rules, standards, and guidelines are far from satisfactory. Specific functional guidelines exist for some sections, such as those for designing headworks for hydropower systems. However, faithfully discharging the duties and tasks assigned following transparency and a non-discriminatory process is still lacking in the implementation sphere. Incentives, including reward and punishment mechanisms, lack in practice and personnel dedication to deliver, become non-committal, slow, and much to be desired. Public private partnerships, cost-recovery systems in public investments such as irrigation fee recovery, payments for eco-system services will need to be explored and strengthened.

Innovative water governance practice: The government programs rarely fund pilot testing or investigative experimentation on water governance and are slow in adopting Information and Communication Technologies to speed up work and enhance service delivery. Some attempts at decision support systems and databases were carried out at the WECS to support basin organization activities, but the DSS system was non-operational and out of use. Offices are gradually implementing GIS and databases, but the knowledge to keep it running and improving further to scale out has not happened yet.

6.1.3 Trust and Engagement

This pillar relates to the contribution of the governance framework to gain public confidence based on concepts of fairness, equity, inclusion, and democratic legitimacy at large.

Integrity and transparency: The legal and institutional frameworks profess integrity and transparency to hold decision-makers and stakeholders accountable, but the actual practice and perceptions are the opposite. The public often questions the integrity of government decisions and allocations, especially regarding project selection, procurement, and making budgetary allocations, but justifications and responses are often not convincing. Norms and codes of conduct are established with safeguard mechanisms of audits and annual personnel performance evaluations. These are still areas that need much improvement and stricter watchdogs.

Promote stakeholder engagement: Mapping of stakeholders, including them and other under-represented marginalized categories, is a practice that is gradually being adopted and enforced. However, the procedure often becomes mechanistic, subverted by designs to expedite implementation and minimize conflicts. This process of including public stakeholders, holding dialogue, and even sensitizing them to enable meaningful participation has caught up more in the water sector. This is especially true as water is an important resource with high sentimental value.

Managing trade-offs: Water is a unitary resource with multiple uses, and one use often precludes or limits the other uses. This introduces tradeoffs managed through participation, partnerships and a common understanding of stakeholders. This practice is also lacking in Nepal as the government rarely carries out multi-link analyses to preemptively examine possible costs and tradeoffs to different sections of society.

Monitoring and evaluation: Examining how the enacted and enforced policies meet the stated objectives is a practice that has not been adopted in Nepal in recent years. Monitoring and evaluation is an ongoing activity providing feedback to improve the policy scenario further. The government mostly practices fiscal progress monitoring and the real monitoring of policy interventions, and their delivery has not been taking place satisfactorily.

Water sector policies correctly state the content and intention to be aiding in fulfilling the national goal of prosperity. This discussion and review manifest findings broadly classified as major water issues and challenges.

6.2 Major Water Issues and Challenges

6.2.1 Water Resource Information

Extreme variable resource: There is extreme variability in rainfall in the basin areas and hence discharges in the rivers. The variability is in time (seasonality and temporal) and location (spatial). The country may appear rich at times in terms of water. Still, it may be considered poor later when it is unavailable when needed—different locations within Nepal show, on average, water-deficient and surplus areas. Deficiency here is defined in terms of whether the resource present in the areas or basins is less than that required to irrigate suitable agricultural areas in the basin or sub-basin.

Unverified data/information: There is difficulty in obtaining quality data on water resources. Most of the information is mostly “passed on information” without peer review and audits. Information on rainfall discharge etc., is still missing or not reliable. We still use data presented in reports prepared 25-30 years ago. We have a barrage at the outlet of the Kosi River into India, and we are not sure what is the average discharge rate of the Kosi River. Available “passed on” information is not peer verified. We should have a better custodian of data, vetting information, updating reports and studies.

6.2.2 Resource Utilization

Extremely low usage: Despite adequate water and plenty of need, Nepal has not utilized this resource. It suffers from a low level of usage. Whether in hydropower development or building irrigation systems, Nepal’s results of engaging in this field for decades have neither delivered the goods nor the experience. It doesn’t gain the external investors’ confidence also.

Low investment capability: Water projects are large investment projects with long gestation periods and require longer time for repaying credits. The nation has many demands or “sinks” for fiscal resources that cannot be evaded. Garnering large funds for implementing larger projects is difficult, and the economy’s disbursement and absorbing capacity also need further investigation.

Challenging environment: Nepal’s physical terrain is challenging, making project implementation costly. Add to this the prevalent red-tapism and multiple regulatory hassles (from counting trees

for environmental clearance to obtaining import clearance for critical machinery and raw materials). The costs soon increase higher than what is prevalent in other parts of the world and the neighboring countries. Nepal is a water resource-rich country using the costliest electricity in South Asia, even when its energy source is water - a renewable resource.

6.3 Key Issues of Governance

6.3.1 Policy Problems and Implementation Dichotomy

Our goals and policies are well-intended but often lack the follow-through mechanism of implementation. Good intentions in policy are not being transformed into good infrastructure or service delivery in Nepal. Policies are not followed through in tandem with legal and institutional instruments such as well-thought-out action plans, guidelines, and operational manuals. Poor service delivery often emanates from unawareness of one's impact on the program's result, lack of confidence, and procedural difficulties in implementation. The government sector also lacks sufficient well-designed guidelines and procedural directions in carrying out one's designated tasks.

6.3.2 New Governance Structure and Old Styles

Confusion within the three-tier system: The new constitution with federalism and the three-tier governance system is supposed to reduce the central hegemony and improve access to governance, enhancing service delivery. But this has instead resulted in greater confusion regarding scope, authority, responsibility, and liability. Procedures have not been written or established yet, and it all originates from the lack of clarity on who owns water, the river stretch, the resource, and the associated problems. The provincial and local governing bodies also look up to the federal level for funds, guidance, and policy directions. Mechanisms to redress complaints, smooth out overlapping jurisdictions, and iron out differences require maturity of the system, as well as an accepted method of sharing costs and benefits, which is direly needed.

Service delivery needs improvement: Government service delivery is slow to transform, innovate, and improve. The governance system must respond to citizens' demands and change to become more service-oriented. Capacity building of the government employees and building specialized teams for specialized tasks is required so that there exist capable employees who are service providers.

6.4 Climate Interventions Required

6.4.1 Uncertainties Need to be Conveyed with Certainty

Climate change has introduced uncertainties in the water sector regarding availability or non-availability, so confusion exists on whether to carry on with the business-as-usual or change it. If the answer is to change, what to change arises to arrive at better design solutions. Our interactions with government officials, field staff, design engineers, and the construction industry all express their conviction on the need to address climate change. Still, the questions remain on how one can adapt to change or mitigate the process.

For example, the high incidences of higher floods require bigger embankments and conveying capacities of culverts and bridges in Nepal. The cascading effects of disasters such as the Melamchi floods and the high-intensity downpours causing the Manang floods in June 2021 often make the work of designers and planners risky and uncertain. The design fraternity is confused about what risks to take and what flood levels and discharge values to design for. They need to be stated as a value to design the structures. Giving them an envelope of uncertainty and probability values is too confusing. The engineers further stated that climate change had put their skills at risk as there is no approved code to standards to follow to indemnify their actions in case of extreme events occur. Building larger, more robust structures may be future climate-proof to some extent, but it's economics and project feasibility will be at risk.

These questions need to be answered with certainty and build the common employee's working attitude and prepare a responsive population. Tools, informatics, and guidelines need to be developed or updated to include how to address climate change and the changes brought about by it. Basic training for people in planning and executing positions should be given priority to mainstream their work performance.

6.4.2 Make Decisions Based on Science and Facts

Often rule of thumb approaches and ad hoc decisions undermine climate actions and aggravate climate impacts. Understanding the basic science of the problem often leads to identifying potential solutions, methods, and instances to prevent these problems from happening.

For the water sector, Nepal has a high spatial and temporal heterogeneity in climate, including temperatures and precipitations. Rainfall patterns change within a short reach, so the design of civil engineering structures needs to be customized to each location. Designing adaptive features and incorporating mitigation measures requires a good grasp of process-based analyses based on a science-based approach and replicating or scaling out success stories from other areas. The importance of communication and knowledge documentation, and sharing becomes important here. Here also, updated guidelines, operating procedures, and manuals make it easier for policymakers, workers, and employees to make appropriate decisions based on some scientific basis. Interventions and change processes are costly and require resources. It is better to be analytical and logical in making the best decisions to move forward to make the best possible impact.

6.4.3 Suite of Adaptive Measures

A suite of adaptive measures is required, which can be customized to local situations and settings. Floods or droughts cannot be prevented. These are natural processes. Damage from floods occurs, but we need to manage the risks to minimize losses. We need to adapt ourselves, our practices, and our development efforts. Nature-based solutions are often cited as the best adaptive mechanisms widely applied in the water sector (OECD, 2020).

Nepal poses a unique challenge as it covers a diverse geological, topographical, and ecological environment vulnerable to different risks. Government officials and working local officials are often ill-equipped and lack the expertise to customize adaptive solutions to local problems. A hand book of adaptation practices with examples and customizable solutions would help at all levels of interventions in Nepal.

Adaptative measures can be in the form of prescriptive guidelines, for example, on preparing for floods and how to respond in times of flood to preparing better standards in constructing levees and dams, flow retarding mechanisms, etc. We could plan and build storage schemes to address drought and shortage of water. Even non-structural methods and interventions in land use planning "to map out flooding zones, stating probabilities or risks of flooding, and utilize this information to categorize allocated areas to functions that can bear those risks. This can translate to not allowing hospitals, schools, and important infrastructures in areas with higher flooding risks and inundations. A compendium of adaptive measures should be prepared so that the local authorities and trained personnel can identify the most suitable ones to adapt to their needs.

6.4.4 Suite of Mitigating Measures

Climate change can be tackled by mitigating the change as well as adapting to change. Mitigation processes require the adoption of climate-smart technologies and practices. Technological advances and products need to be made available and promoted in the market so that climate-smart decisions are made choosing products that prevent the release of greenhouse gases. Reduction in fossil fuel consumption and decreasing the carbon footprint and water footprint are all practices that help mitigate climate change. All countries have NDCs, which layout national commitments, including mitigating measures. These state the targets to achieve and describe the methods to achieve them.

A suite of such mitigating measures should be made related to climate change impacts on the water sector.

It is essential to recognize that understanding the climate change impacts at the local level is a priority action. This means navigating the complex plausible scenarios, pathways, and myriad models, including requirements of data, computing tools, and expert skills. Climate interventions require specialized training and regular updates in developing a cadre that further trains others and develops tools and guidelines for adoption.

6.5 Gaps and Need Assessment for Water Resource Management in Nepal

The analysis of Nepal's water sector setting and policy reviews also enabled the gaps and need assessment for water resources management in Nepal. The assessment is included in Annex B.

The gaps and needs assessment reveal an overall need for an enabling environment to enact suitable policies and legislations at the federal, provincial, and local levels. The needs include:

- A clear distinction of roles, responsibilities, and inter-relationships between all levels of government regarding water bodies and projects to enforcement of regulations and legal codes as per the new Constitution and mandates
- Integrated water resources management with a basin-wise approach with greater emphasis on climate change adaptation to achieve water, energy, and food security for the country
- Need for water accounting to monitor, evaluate, and sanction uses of water
- Mainstreaming gender equality and social inclusion (GESI) issues in water resource management.
- Capacity development to realign the institutions to deliver policy aspirations and strengthen them with skilled personnel at all levels.

The capacity-building efforts should be concentrated in various domains ranging from capability in analyzing data, using disruptive technologies, designing interventions, and executing projects by considering climate-related information to understand uncertainties, vulnerabilities, and risks at the project and program levels. Capacity enhancement should also focus on ways to address the challenge of “too much and too little water” to cater to varying demands. Irrigation being a major consumer of water, there is a need for capacity building on water use efficiency in irrigation, conjunctive use of groundwater in water-scarce systems, and complementing with agricultural support services to maximize outcomes. There is also a need to develop capacity for climate adaptation or mitigation measures, climate-smart approaches specific to the water sector, and general climate change management and financing.

Water quality is another important factor that will be further impacted in future. Setting up various water quality standards, such as those for potable water, effluents and receiving water bodies as well as enforcing these standards with suitable monitoring and reporting mechanisms to enable fines and sanctions to defaulters is essential. Various practices to prevent pollution of water bodies and groundwater must be strictly followed through.

Though fulfilling the above needs is likely to align the water sector institutions in Nepal to achieve the goal of building resilience to climate change, there is also a need for leadership, stable government, and bureaucracy to streamline policy and institutional hassle along with the political will and public support to ensure stable fields for project implementation.

All these challenges and needs in water resources management in Nepal may appear daunting. Still, this sector is key to the promise of prosperity to the nation, ensuring water, energy, and food security. For this to work, the nation will have to embark on a sustainable approach addressing the impacts of climate change and associated risks.

6.6 Best Practices and Additional Information

Several countries have implemented effective water policies that successfully incorporate climate change aspects and are successful examples of sustainable management of water resources. These two developed world examples are policy environments other countries look up to and hope to adapt to their situations.

Australia has implemented integrated water resources management approaches, such as water allocation plans, trading systems, and water efficiency programs. The country has also focused on water conservation and demand management strategies, including public awareness campaigns and water pricing mechanisms. These are excellent examples of managing water scarcity, quality, and quantity issues.

The Netherlands has comprehensively adopted excellent water policies demonstrating its excellence in water management, including flood risk management, water infrastructure planning, and water governance. The country has implemented innovative solutions such as water-sensitive urban design, polder systems, and participatory water management approaches. It has also successfully implemented the “Room for River” approach in the sustainable management of floods and risk management.

A document, prepared by ESCAP and K-Water, provides a compendium of success stories in water sector interventions through IWRM approaches and other policy initiatives or actions supported by good policies. The collection of success stories includes case studies from Asia and the Pacific facing serious challenges in terms of water quantity and quality in sustaining its long-term economic growth prospects and achieving sustainable development. It includes examples of the IWRM approach in China, a water-saving project in Malaysia piloting a smart-water partnership, institutional building, policymaking for water and the environment in Myanmar, etc. The report is available at the following link. https://www.unescap.org/sites/default/files/WWF_CaseStudies_final.pdf

At a closer region, the Niti Ayog in India has published a compendium of best practices in water management at the local scale. These are available in the link. https://www.niti.gov.in/sites/default/files/2021-11/Compendium-of-Best-Practices-in-Water-Management_03-11-2021_compressed.pdf

Additional knowledge, methodologies, case studies, and practice repositories are available online. The two most important ones that can be referred to are the OECD Water Governance Programme and the Global Water Partnership. The latter is the main resource for IWRM design, implementation, and monitoring. The Water Governance Programme of OECD advises governments at all levels on designing and implementing better water policies for better lives. Their websites are:

- [OECD Water Governance Programme](#)
- [Global Water Partnership](#):

The International Water Resource Association also offers policy briefs that can be a good source of information for implementation at the national or local scales. They offer two series of policy briefs. Blue Series or the Water International Policy Briefs are based on special thematic issues of IWRA's journal and published with the support of Routledge Press. Green series IWRA Policy Briefs are published in association with key partners. The briefs inform on contemporary policy issues and are respected internationally as excellence in the water sector and are available at the following [link](#).

7. CONCLUSIONS

The report presents a background on the water resources sector of Nepal. It reviews the policies and regulations scenario to understand better the policy and legal aspects of Nepal's water resources development and management. The water resource sector is viewed as prime catalysis to help achieve national goals of economic development, poverty alleviation, food security, public health and safety, decent standards of living for the people, and protection of the natural environment.

The water resources of Nepal demonstrate a spatially and temporally varying nature arising from different climatic systems posing unique problems and opportunities for its development and management. A review of the water sector policies and other related documents was carried out. More than 80 official documents (policies, plans, strategies, acts, etc.) were reviewed, with some in greater detail for those directly related to water resources. The National Water Resources Policy 2020 was recently released with the goal "to sustainably conserve, manage and to carry out multipurpose development of the available water resources contributing to the economic prosperity and social transformation of the country." It adopts the principles of IWRM and the river basin organizations to advance water management. It was found that the province-level governments are still lagging in forming legislation or regulations related to water and follow the inherited policies or newly enacted federal policies.

The key findings illustrate that performance ratings of the policies and institutional framework collectively demonstrate deficiencies in all three dimensions of water governance – effectiveness, efficiency, and trust and engagement. Definitive quantitative indicators to measure the performance of these three pillars and the associated 12 principles were difficult to analyze as more efforts are needed for data and record collection in Nepal. Qualitative assessments reveal the policy framework to be unsatisfactory and not fully conducive to addressing the primary pillars of the good governance framework.

Issues exist in both availability of information and the extent of utilization of the available resources. Reliable and accurate data to plan and implement water sector activities are not available. The distribution of water resources is highly variable in season and location and thus requires finer resolution data with greater accuracy and reliability to quantify water availability or determine the extent of the deficit. The amount of water used is still small compared to the annual availability signifying the inability to use the resource and capitalize on its presence. This is a classic case of low resource utilization, accruing low benefits and again minimizing the capacity to utilize further due to the absence of sound policies, transparent procedures, and unifying consensus on the use of critical resources.

Problems of governance in water emerged in this review with the issues of policy and implementation on the ground level. Our goals and policies are well-intended but mostly lack the follow-through mechanism of implementation. Good intentions in policy are not enough. It needs to be translated into good infrastructure or service delivery. Policies are not followed through in tandem with legal and institutional instruments such as well-thought-out action plans, guidelines, and operational manuals.

It was seen that climate-related interventions are required in the water resources development sector so that the uncertainties are conveyed with more conviction and decisions are made based on facts and science, adopting both mitigating and adaptive measures. Often solid foundation works to build upon and inform decision-makers into making suitable policies, guidelines, and operational procedures are missing. Decisions based on populist and opportunistic modes do not necessarily benefit the citizens and institutions long term.

Regarding climate-related policies and the water sector, a portfolio of adaptive measures and mitigating measures with descriptive notes on prescriptive situations is to be prepared so that the government offers efficient responses and benefits. This report, including the analyses contained within, will be an asset to the Ministry of Energy, Water Resources and Irrigation as well as the Water

Energy Commission Secretariat, as the document supports the IWRM implementation, puts forward constructive suggestions in the existing policy regime for integrating climate change aspects and defines key areas for priority actions to improve water resource management and delivery to help achieve national goals of prosperity.

8. RECOMMENDATIONS

The review of policies demonstrated that the policies are indeed geared towards achieving the national vision of “Prosperous Nepal, Happy Nepali” by making Nepal a high-income country by the Year 2043 with a goal that the “living conditions of Nepali people are significantly improved in a sustainable manner.” The National Water Resources Policy directs efforts “to sustainably conserve, manage and to carry out multipurpose development of the available water resources contributing to the economic prosperity and social transformation of the country.” All primary policy documents embrace IWRM principles, and the implementation approaches are recommended to be streamlined toward operationalizing IWRM in Nepal. This will be an important input to the WECS and MoEWRI in streamlining their policies and IWRM implementation programs.

The policy and institutional scenario review demonstrated that these are aligned weakly on three dimensions of water governance – effectiveness, efficiency, and trust and engagement. Therefore, the policies and their implementation need to be re-energized to address these shortcomings primarily in implementation and strategically reorienting to improve service delivery. The current National Water Resources Bill under finalization should address policy implementation, monitoring, and enforcement more strongly and explicitly.

It is recommended that the nation, in all of its governance systems, be proactive to the challenges imposed by climate change by adopting science-based decision-making systems in its policies. Though the country's policies appear responsive overall, they must be translated with proper action plans to be more sustainable and climate-resilient. The new Irrigation Act (being proposed and in the making) as well as the new National Electricity Act, which needs to be updated to fit in the current legal framework, as discussed earlier, need to be enforced at the earliest with enabling regulations following in the short term (2-5 years) time frame.

The following specific recommendations are also made as priority thrust areas of policy intervention to support better governance, reliability, participation of stakeholders, and cooperation in the region. These are tagged to the target policy document or instrument, and the time frame¹⁰ as follows referenced as follows.

- To build a legal system for the development of water resources and management delineating the power and responsibility of the federal center, province, and local level as directed by the constitution. The targeted policy documents and the time frame are: National Water Resources Bill and National and Provincial Water Resources Policies and Acts - as soon as possible.
- Address seasonal fluctuations and spatial shortages in water availability by adopting suitable storage strategies, e.g., water harvesting, groundwater, basin storage or inter-basin transfers, etc. This will help address climate change shocks to the system and adverse impacts on natural ecosystems and the services essential for quality of life. This includes preparing a Strategy for Water Storage short term to help implement the Water Resources Policy 2020, the Climate Change Policy 2019, and the National Adaptation Plan 2021 (MoFE, 2021).
- To develop sustainable and quality infrastructure to address problems of adverse climate change impacts, geological conditions and complex landforms and enhance water security, utilization, conservation and efficiencies. It is suggested to update the National Water Plan 2005 in the short term to guide investments in the water sector. ADPC is taking up the immediate priority action to develop addenda to existing design guidelines in the irrigation and energy sectors to incorporate climate change indicators in designs.

¹⁰ Timeframe are categorized as immediate (complete in 2 years at the latest), short term (2-5 years), medium term (5-10 years), and long term (10 years). Some implementation timelines could be continuously on-going.

- To extend and upgrade the hydro-meteorological measurement system to ensure that more reliable information is available for planning and designing in the water resources sector and irrigation and improve hydro-met services. This involves the Water Resources Bill, Water Resources Policy, and the Proposed Hydro-met Bill on a short-term and continuous basis.
- To adopt a river basin approach in managing water resources with integrated planning, water accounting, and auditing mechanisms. This addresses the Water Resources Policy and Water Resources Bill - a new Act in a short-term and continuous manner.
- To maintain groundwater resources' sustainable utilization, recharge, and quality standards. This attracts the Water Resources Policy and the National Adaptation Plan in a short-term and continuous manner.
- To maintain a consensus among the various stakeholders, particularly the stakeholders at decision-making levels, concerned with developing and managing water resources. This includes the Water Resources Policy and other related Acts, including preparedness for international negotiations on an ongoing basis.
- To garner the required capital for the development of the water resources sector. This includes the Water Resources Bill, Water Resources Policy, and updated National Water Plan in a short-term manner and on a rolling basis.
- To maintain cooperation and collaboration with the riparian countries, primarily focusing on a framework agreement and understanding the bilateral relations. This includes the Water Resources Policy, Acts, etc., in the short-term through capacity development in international negotiations and will have actions required in bilateral relations such as foreign policy instruments.
- To train and build capacity in being more responsive to climate change, enable capacities to advocate for, plan, and implement the above recommendations, as well as enhancing capacities for international or bilateral negotiations with proper analyses, negotiating, and dialogue (through capacity development works to start immediately and continue regularly).

A key outcome from the review following the OECD framework for water governance also revealed that trust and engagement are prime areas needing attention in building public confidence, inclusiveness of stakeholders, and improving overall water governance. This will require long-term action starting immediately in improving service delivery, internal institutional mechanisms, transparency, re-orienting mindsets, staff training, setting up operational standards, procedures, and guidelines, and capacity building with clear support from the polity implementing IWRM principles. This will usher in ownership of the policies and public involvement and ultimately improve sustainability and trust in the governance system.

9. LINKAGES AND ALIGNMENT WITH CARE FOR SOUTH ASIA PROJECT INTERVENTIONS

CARE for South Asia project's broader and specific objectives will bring synergies in both the National Water Resources Policy 2020 and Climate Change Policy 2019 with a particular emphasis on developing tailored strategies for water conservation and integrated water resources management. In terms of the water sector, this project's activities and policies are underpinned by adopting the basin approach in integrated water resources management (Refer to the CARE for South Asia introductory brochure and strategy documents).

In addition, the Climate Change Policy 2019 of Nepal envisions a country spared from the adverse impacts of climate change by optimizing economic, social, and environmental returns on water resources. The policy aims to ensure strategies and measures that will lead to an adaptive techno-economic plan involving the interaction of water, land use, ecosystem, and climate change with development outcomes. Besides developing and expanding rainwater harvesting and storage, protecting water resources is envisaged as an important contributor to development.

The CARE for South Asia project undertakes the following, which is in tune with Nepal's water sector and climate change policies.

- Envisages training and capacity building
- Science and fact-based decision making
- Promotes stakeholder engagement and consultation in the formulation of action plans.

As it has been discussed above, the water sector activities of the CARE for South Asia project will ensure excellent stakeholder consultation with the line agencies and ministries that are involved in the climate change and water sectors with the establishment of sector focal persons and contact points, participation in discussion and "formulation of the way forward" activities to merge our activities and eventually let the government agencies own the product.

Water is the most-cited pathway through which all countries experience climate impacts. The water sector is often the most prioritized sector through which countries seek to build resilience in their economies, populations' livelihoods, and natural ecosystems (GWP, 2019).

9.1 Expected Outcome from CARE for South Asia Project (Nepal)

The project's uniqueness lies in supporting the government's policies on climate change through national and regional dialogues, pilot concepts, and capacity enhancement of stakeholders at all levels and in mainstreaming potential interventions into plans, policies, and investments for a more climate-resilient future. This review report is an output under the CARE for South Asia project and targets primarily the Water Energy Commission Secretariat (WECS) and the Ministry of Energy, Water Resources and Irrigation, including the departments and divisions under it, for supporting their implementation of the water resources policy and Acts, providing critical inputs in identifying entry points for improving implementation of policies or updating them, redefining the strategic directions and for better functioning of water resource management in the country.

ADPC will, in particular, and immediately, support the target institutions in the following three areas, identified in the gaps and need assessment as well as recommended actions:

- 1. Supporting improved water governance:** A consultative approach will be adopted in identifying the best ways to improve water governance. This will focus on clearing the confusion on the roles of the federal, provincial, and local levels of government in water resources by delineating areas of authority, responsibility, and cooperation. Provincial-level consultations and federal-level workshops will be carried out to develop a policy recommendation for the government to implement.

2. Climate-responsive infrastructure design support: To address the climate change-induced variability in hydrology and the uncertainty of future extreme events, ADPC will review the existing design manuals guidelines in the irrigation and hydropower sector to address climate change impacts best and prepare addendum guidelines and checklists to ensure that the design interventions are enabled to address climate change impacts building adaptive and resilient capabilities of the built infrastructure.

Apart from these two primary areas of specific support in the water sector, ADPC will support the government offices in capacity building through climate leadership training programs, holding sensitization and technical workshops to enable government officials to understand climate uncertainty and modeling approaches better.

These capacity development efforts will enable stakeholders to understand the scientific information generated as part of technical support and translate these to adopt investment strategies to accelerate climate-resilient water resources development in Nepal.

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ANNEX A: LEGAL INSTRUMENTS RELATED TO WATER SECTOR

The following legal instruments demonstrate the landscape of legal and policy provisions in Nepal.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
Policy		
1.	Hydropower Development Policy (HDP) 1992	<p>Render assistance in the conservation of the environment by supplying clean energy through the development of hydroelectric power.</p> <p>Extend the use of electricity for making the minimum utilization of fuelwood and to render necessary assistance in the conservation of forests and the environment.</p> <p>To minimize the environmental hazards, the construction or operation of the hydroelectric project shall be made in such a way that it would have a minimum adverse effect on the environment.</p> <p>This policy was superseded by a newer one in 2001, described below.</p>
2.	The Hydropower Development Policy 2001	<p>Stressed on environmental protection while developing hydro projects. The policy includes environmental protection by developing hydropower as an alternative to biomass and thermal energy, and to mitigate adverse environmental impacts likely to result from the operation of hydropower projects, appropriate provisions shall be made to resettle the displaced families.</p> <p>EIA study report shall be made in the project to govern the environment-related matters during the construction of hydropower projects.</p> <p>Provision has been made to release at least ten percent of the minimum monthly average discharge of the river/stream or the minimum required as identified in the EIA study report.</p>
3.	Forest Policy 1993	<p>Stressed contributing food production through effective interaction between forestry and farming system, to protect the land against degradation by soil erosion, landslide, and other effects of ecological disturbances, and to conserve the ecosystem and genetic resources.</p> <p>Re-emphasizes avoiding forest destruction or tree cutting while constructing infrastructures during the implementation of projects other than the forest sector.</p> <p>Prioritized the protection of Siwalik, a geologically vulnerable area, with a view to ensuring watershed conservation and maintenance of water recharge.</p> <p>The policy also stresses the conservation of endangered species. Emphasizes the implementation of community and private forestry development,</p> <p>Programs, national parks and conservation areas management programs, soil and watershed conservation program, management and development of medicinal plants, and conservation of biological diversity.</p>

S.N.	Legal Instruments	Key Provisions Related to Water Sector
4.	Climate Change Policy 2011 (Superceded now)	<p>Improve livelihoods by mitigating and adapting to the adverse impacts of climate change, adopting a low-carbon emissions socio-economic development path, and supporting and collaborating in the spirit of the country's commitments to national and international agreements related to climate change. Requires allocating more than 80 percent of the total climate change fund for field-level activities.</p> <p>This has been superseded by the Climate Change Policy.</p>
5.	Land Use Policy 2015	<p>Categorize or classify entire lands of the country into various Land Use Zones (LUZs), devise level-wise (Federal, Provincial, and Local) Land Use Plans (LUPs), and ensure 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, and for forests areas including natural heritages, biodiversities and historical, cultural and religious, archaeological and areas of strategic importance.</p> <p>In further, it has addressed issues such as mitigating natural and human-created-disastrous hazards and assessing and applying minimum property valuation and progressive tax systems on lands based on specific use after getting prepared plot-based records.</p> <p>Land-use change management is of great importance in nature conservation.</p> <p>Entail formulating in a coordinated way by ensuring the participation of government and public agencies as well as the private sector by linking productivity, environmental balance and conservation, social and economic prosperity, and poverty alleviation to be linked.</p>
6.	Rural Energy Policy 2004	Cautioned on environmental degradation and stressed developing environmentally friendly energy resources and emphasizing environmentally friendly rural energy technology.
7.	Rural water supply and Sanitation National Policy 2004	Stressed on safe, accessible, and adequate water supply and sanitation.
8.	National Agriculture Policy 2004	<p>Envisioned that the agricultural sector shall be to bring about an improvement in the standard of living through sustainable agricultural development to be achieved by transforming the current subsistence-oriented farming system into a commercial and competitive farming system.</p> <p>Policy obliged that natural resources, as well as the environment and bio-diversity, shall be conserved, promoted, and properly utilized.</p>
9.	Irrigation Policy 2013	<p>Recommended an optimal use of water resources in providing round-the-year irrigation services to the cultivable areas as far as possible.</p> <p>Identified that the project/system shall be completed by minimizing the negative effects on the environment in the course of construction of the project/ system.</p>

S.N.	Legal Instruments	Key Provisions Related to Water Sector
		<p>Necessary public awareness campaigns shall be increased at the governmental, non-governmental, and local levels in this regard. The environmental impact evaluation (IEA) or preliminary environment examination (IEA) shall be conducted as per necessary under the prevailing law through a public hearing in connection with the negative impact on the environment from the project.</p> <p>This Policy has been superseded by a new policy described in the main text.</p>
10.	Water-induced Disaster Management Policy 2015	Emphasized that water-induced disaster management programs to be aligned with the IWRM principle and the river basin development concept; to align with integrated river basin development and conservation and a master plan at the national level and at the local level to be formulated; and be prioritized according to short-term, medium-term and long-term perspective and implemented with active community participation.
11.	Land Acquisition, Resettlement and Rehabilitation Policy 2015	<p>Enacted to facilitate the land acquisition process for infrastructure projects.</p> <p>Outlines the need to conduct an economic and social impact assessment of the development project despite the existing Land Acquisition Act facing of these issues.</p> <p>Adds all expenses related to land acquisition, compensation, and the implementation of resettlement and rehabilitation plans should be considered project costs.</p> <p>Underlines that compensation amount entails providing as per market rate to the displaced.</p> <p>Provisioned to act against those disrupting land acquisition processes or creating hurdles for project developers that have acquired land by the due process of law.</p>
12.	Public-Private Partnership Policy 2072	<p>The policy aims to increase private participation in the development of the infrastructure sector by adopting policies to attract the private sector and create a win-win situation that can be rewarding for both the public and private sectors.</p> <p>To promote PPP-related current principles and norms of international standards in all feasible areas, apparatus, organs, and entities of the state.</p> <p>To create a conducive atmosphere for the investment of additional capital, means, and resources required for the development, reconstruction, management, and operation of infrastructure services from the private (domestic and foreign) sector.</p> <p>To make optimal utilization of professionalism, entrepreneurship, ability, competency, and the latest technologies of the private (domestic and foreign) sector in the development, reconstruction, up-gradation, operation, and management of infrastructure services for the country's overall development.</p>
13.	Draft Water Resources Policy-	Entail three different levels of government to ensure clarity in the role and responsibilities along with WECS through legal instruments, policy measures, and institutional support.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
Strategy		
14.	National Energy Strategy of Nepal 2013	Need for simplification of EIA for small hydropower projects, recommended to make simpler and differentiate the time frame for EIA for small, medium, and big hydropower plants.
15.	Rural water supply and Sanitation National Strategy 2004	Environmental appraisal/screening for implementing projects, procedures to be prepared to minimize environmental damage, and public participation while screening the projects.
16.	Agriculture Development Strategy (2015-2035)	<p>A self-reliant, sustainable, competitive, and inclusive agricultural sector that drives economic growth and contributes to improved livelihoods and food and nutrition security, leading to food sovereignty.</p> <p>Improved Resilience of Farmers to Climate Change, Disasters, Price Volatility, and Other Shocks</p>
Act		
17.	Aquatic Protection Act 2017	<p>Provisioned the protection of aquatic animals. Provides legal protection of aquatic animals and their habitats. Prohibited application of harmful fishing gear such as explosives, poisonous chemicals, and electric rods, as well as hunting of waterfowls and destruction of water resource development-related infrastructures.</p> <p>Permits only the use of safe pesticides in case any poisonous substance recommended by a technical officer is to be used for catching aquatic life.</p>
18.	Civil Code 2017	Restricted to use of entire water stream or polluting water originates from personal property and entails minimum stream flow to downstream level from the river, irrigated lands are ensured regular water access, and new canals shall not reduce substantial water flow to the irrigated field.
19.	Criminal Code 2017	<p>Pollution to the environment falls under the Criminal Code.</p> <p>The environment should not be polluted, and everyone is entitled not to make significant adverse environmental effects. Harmful waste is strictly forbidden, with imprisonment and monetary fines.</p>
20.	Consumer Protection Act 1999	Protect consumers from irregularities concerning the quality, quantity, and prices of consumer goods or services, ensuring that no one lowers or removes the attributes or usefulness of consumer goods or services, safe and quality consumer goods or services, and protecting the rights and interests of consumers.
21.	Development Board Act 1956	Provisions for the expeditious and smooth execution of development plans and development. Based on this formation, an order has been executed for energy, hospital, etc.
22.	Disaster Risk Reduction and Management Act 2017	Provisioned for disaster management policy, plan, and strategy approval and implementation by doing disaster cycle management—preparedness, response, recovery, and mitigation.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
23.	Electricity Act 1992	<p>Governs the use of water for hydropower production and establishes a system of licensing.</p> <p>Sets out the powers, functions, and duties of a license holder and also provides certain financial incentives for license holders.</p>
24.	Electricity Theft Control Act 2002	Provisioned for controlling electricity theft.
25.	Environment Protection Act 1997	<p>The Environment Protection Act, 1997 of GoN contains several legal provisions to institutionalize the integration of environmental concerns in development projects, including the road sector, and empowers the Most to approve EIA reports.</p> <p>Similarly, in the case of the IRE level study, the line Ministry, Ministry of Physical Infrastructure and Transport (MoPIT) for the proposed Project, is authorized to approve the final IEE Report.</p> <p>Major highlights of the EPA, 1997 are as follows:</p> <ul style="list-style-type: none"> • Recognizes the interdependence between development and the environment and shows the concerns for minimizing the impacts of environmental degradation on people, animal, and plant species and their physical surroundings, • Obliges the proponent to undertake IEE and EIA of proposal, plans, or projects which may cause changes in existing environmental conditions and authorizes the then MoSTE to clear all EIA and line ministries for IEE study, • Empowers the MoSTE to prohibit the use of any matter, fuel, equipment, or plant, which has adverse effects on the environment, • Compensate affected persons from polluting activities/ polluters, • Empowers government to provide additional incentives to any industry, occupation, technology, or process, which has positive impacts on environmental conservation, • Establishes an Environmental Protection Fund to be used for environmental protection, pollution control, and heritage conservation, and • Gives the government authority to declare specific areas as environmentally protected areas.
26.	Essential Commodity Protection Act 1955	Identified as drinking water an essential commodity, and strictly protects drinking water and prohibits any unauthorized use or misuse, stealing, damaging, etc., of drinking water.
27.	Foreign Investment and Technology Transfer Act 1992	Promotes foreign investment and technology transfer for making the economy viable, dynamic, and competitive through the maximum mobilization of limited capital, human, and other natural resources.
28.	Forest Act 1993 Repealed by the Forest Act 2019	Requires decision makers to take account of all forest values, including environmental services and bio-diversity, not just the production of timber and other commodities. The basis of the Act is resource-oriented rather than use-oriented.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
		<p>Contains several provisions to ensure the development, conservation, management, and sustainable use of forest resources based on an approved work plan. The work plan should contain a list of activities that should be implemented in the different forest categories; national, community, leasehold, private, and religious forests.</p> <p>Empowers the government to delineate any part of the national forest which has 'special environmental, scientific or cultural importance' as a protected forest.</p> <p>Forest Act to provide parts of any type of forest for the implementation of a national priority plan with the assurance that it does not adversely affect the environment significantly.</p> <p>Superseded by the Forest Act 2019.</p>
29.	Soil and Watershed Conservation Act 1982	The Soil and Watershed Conservation Act 1982 has a legal arrangement to conserve soil and watershed by controlling natural hazards like floods, landslides, and soil erosion.
30.	Inter-governmental Fiscal Management Act 2017	Intergovernmental Fiscal Management Act, the central government is required to give 15 percent of the VAT and excise duty collected natural resources such as electricity, mines and mineral and water, and other natural resources to the local government and another 15 percent to the provincial government.
31.	Investment Board Act 2010 (Repealed by PPP Investment Act 2019)	<p>To promote foreign direct investment and streamline government procedures, the Investment Board was formulated.</p> <p>The Public-Private Partnership Act and Investment Act 2019 have recently superseded this Act.</p>
32.	Industrial Enterprises Act 1992	Requires permission for the extension and diversification of environmentally sensitive industries. Provides financial incentives for industrial enterprises that minimize harmful effects on the environment.
33.	Land Acquisition Act 1977	<p>Empowers the government to acquire land for public purposes by providing compensation for private land and properties, as determined by the Compensation Fixation Committee.</p> <p>Government can acquire land at any place in any quantity by giving compensation for the land acquired for any public purpose or for the operation of any development project initiated by government institutions (Sections 3 and 4).</p> <p>The power given under these sections is very broad, as the government is empowered to acquire any land in the name of public works.</p>
34.	Land Revenue Act 1978	Enacted Act to collect and recover the land revenue and to make some additional provisions on the cultivation of land.
35.	Local Government Operation Act 2017	Local governments are empowered under the heading of additional functions, duties, and powers to formulate land use plans and policies, action plans, and implementation as per federal and provincial level laws and regulations.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
		<p>For the relating to environmental conservation and ecological diversity issues, under the Sub-section 2 (j), Section 11, functions, duties, and roles of local government have been empowered to work on (12) to prepare environmental conservation, ecological diversity related policy, law, standard, plan formulation, implementation, monitoring, and regulation, (13 &14) reducing local level environmental hazard and pollution (15) solid waste management (17) conservation and protection of green areas, and (19) local level environmental protection by determining of environmental protection areas.</p> <p>Moreover, relating to water resources, wildlife, and minerals (p) entails being preserved and protected by the local government.</p> <p>Under Subsection (4), forest, wildlife, water uses, environment, and ecological diversity has been empowered under local government subject to central and provincial laws and regulation.</p>
36.	Natural Resources and Fiscal Commission 2017	<p>National Natural Resource and Fiscal Commission shall devise a formula for the distribution of grants, revenues, and royalties to subnational governments.</p> <p>Duties include natural resources protection and making decisions on the uses of natural resources among central, provincial, and local governments.</p>
37.	Nepal Electricity Authority Act 1984	Enacted legislation for the establishment and management of the Nepal Electricity Authority to make arrangements for power supply by generating, transmitting, and distributing electricity in an efficient, reliable, and convenient manner.
38.	Nepal Water Supply Corporation Act 1989	<p>Establishment of the Nepal Water Supply Corporation as an autonomous government-controlled corporation responsible for the supply of drinking water.</p> <p>Prohibits certain acts and provides penalties/punishment for violation.</p>
39.	Public Private Partnership and Investment Act 2019	<p>As a majority of the infrastructure projects implemented by Investment Board Nepal are being developed under the public-private partnership model, the government recently introduced this new law to replace the existing Investment Board Act.</p> <p>The Act sets the role of the Public-Private Partnership Centre at the Investment Board of Nepal to identify projects, manage public financing, control and oversee public-private partnership projects, develop a public-private partnership framework, advise and support agencies to implement public-private partnership projects, act as a knowledge center and, in some cases, also work as a project bank.</p> <p>The Investment Centre will promote Nepal as an investment destination besides providing investment approvals.</p> <p>This Act repeals the Investment Board of Nepal Act.</p>
40.	Ship Registration Act 1971	Provisioned for the registration of ships of Nepal ships traveling at sea

S.N.	Legal Instruments	Key Provisions Related to Water Sector
41.	Water Supply Management Board Act 2006	Enacted to establish and operate the Water Supply Management Board on making proper and effective, reliable services to the residents of the municipal areas by making water supply and sanitation services regular, managed, qualitative, and easily available.
42.	Water Supply Tariff Fixation Commission Act 2006	Establishment of the Water Tariff Fixation Commission for the protection of the Interests of consumers by providing qualitative and reliable water supply and sanitation service to the consumers at a reasonable price by fixing the tariff of water supply and sanitation service.
43.	Water Tax Act 1966	Manages the modus operandi of recovering the amount of the water tax leviable.
44.	Nepal Electricity Regulatory Commission Act 2017	A regulating body for the energy sector has been designed to regulate the quality and safety of the respective business practices. Has a duty to regulate tariffs for retail and wholesale levels. Has to aim at providing access to the transmission and distribution sector so that unbundling process moves smoothly in those sectors.
45.	Draft Water Resources Act	The new draft Act entails addressing the following; <ul style="list-style-type: none"> • Set rights and accountability provisioned in the Constitution of Nepal relating to water resources use at the federal, provincial, and local levels; • River basin boundaries entitled does not fall under provincial or local jurisdiction; • Stressed on optimizing benefits from each river basin, an integrated approach leading to multipurpose projects under IWRM is required by different levels of government(s).
Rule(s)		
46.	Drinking Water Rules 1998	Regulates the use of drinking water. Provides for the formation of Drinking Water User Associations and sets out the procedure for registration, deals with licensing of the use of drinking water, and deals with the control of water pollution and maintenance of quality standards for drinking water. Sets out the conditions of service utilization by consumers. Provides for the acquisition of house and land and compensation.
47.	Drinking Water Service Charge (Recovery) Rules 1994	Provisioned for water connection/access, meter reading, rate of water, etc.
48.	Electricity Tariff Fixation Rules 1994	Formation of tariff fixation commission, meeting procedures of the commission
49.	Electricity Rules 1993	Provisioned procedure for obtaining a license and powers, functions, and duties of license holders. Process of acquisition of house and land and compensation.
50.	Electricity Leakage Control Rules 2002	Investigation and Inquiry, Assessment of Unit of Stolen Electricity, provisions of fines

S.N.	Legal Instruments	Key Provisions Related to Water Sector
51.	Environment Protection Rules 1997	<p>Contains the elaborative provisions on the process to be followed during the preparation and approval of projects requiring EIA and IEE, including scoping documents, terms of reference, information dissemination, public consultation and hearing, and environmental monitoring and auditing.</p> <p>EPR calls for public consultation prior to the preparation of scoping document and ToR and public hearing prior to the approval of the EIA Report.</p>
52.	Irrigation Rule 2000	<p>Deals with Irrigation Water User Associations and the transfer of projects to Irrigation Water User Associations. Deals with Irrigation and River Control Committee.</p> <p>Sets out the conditions of service utilization. Sets out the obligations of the user of irrigation and provides for service charges. Deals with the protection, repair, and maintenance of irrigation systems.</p> <p>This Rule will need to be revised to enable the new Water Resources Policy 2020. Even the Irrigation Policy was renewed in 2013 after this Rule.</p>
53.	Rafting Rule 2006	<p>Prevails rafting entrepreneurship for conducting rafting business. Rafting Business has been restricted for doing business without License or without getting a license.</p> <p>Provisions related to environmental clearing and waste management to make responsible license-holder entrepreneurs.</p>
54.	Water Resources Rule 1993	<p>An umbrella Rule governing water resource management. Sets out the procedure to register a Water User Association and obtain a license.</p> <p>Establishes the District Water Resource Committee.</p> <p>Sets out the rights and obligations of Water User Associations and license holders.</p> <p>Deals with the acquisition of houses and land and compensation.</p>
55.	Pesticide Rule 1994	Provisioned for import, export, production, purchase, sale, and use of pesticides.
56.	Solid Waste Management Rules 2013	Local government is responsible for the segregation and discharge of solid wastes and made responsible everyone for harmful waste.
Guidelines /Directives/Manuals/Working Procedures		
57.	National EIA Guideline 1993	<p>National EIA Guidelines were endorsed by Government in September 1992 and gazetted in June 1993.</p> <p>The guidelines also provide clear directions on how EIAs are to be conducted in Nepal and specify responsible agencies.</p> <p>These guidelines were developed in the process of establishing a national system of EIA in Nepal.</p>
58.	Guidelines for Study for Hydropower Projects 2003	Recommended PFS/FS for IEE and EIA under EPA/EPR, developed guidelines for hydrological and sediments study, energy computation, and benefit assessment.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
59.	National Drinking Water Quality Standard 2005	Standard has fixed parameters for rural surface water systems as well as rural groundwater supply systems.
60.	Drinking Water Service Operation Directive 2012	Directives to regulate water supply providers, monitoring and evaluation, ensuring water quality, regular access, transparency, and accountability applicability to service providers.
61.	EIA/IEE Working Procedure for Hydropower and Transmission Lines 2016	Enacted Guidelines for simplifying the EIA process under Electricity Rules 1993.

Treaties and bi-lateral Minutes

62.	Treaty Between The Government of Nepal and the Government of India concerning the Integrated Development of the Mahakali Barrage, Including Sarada Barrage, Tanakpur Barrage, and Pancheshwar Project 1996	Determined to development of water resources, Realizing the desirability to enter into a treaty on the basis of equal partnership to develop water resources and their utilization, Nepal and India entered into an arrangement for the construction of the Sarada Barrage in the Mahakali River, whereby Nepal is to receive some waters from the said Barrage.
63.	Revised Agreement between the Government of Nepal and the Government of India on The Koshi Project 1975	India was desirous of constructing a barrage, headworks, and other appurtenant works about three miles upstream of Hanuman Nagar town on the Kosi River with afflux and flood banks, and canals and protective works on land lying within the territories of Nepal for the purpose of flood control, irrigation, generation of hydro-electric power and prevention of erosion of Nepal areas on the right side of the river, upstream of the barrage.
64.	Agreement between the Government of Nepal and the Government of India on the Gandaki Irrigation and Power Project 1959	Nepal and India to construct a barrage, canal head regulators, and other appurtenant works about 1,000 feet below the existing Tribeni canal head regulator and of taking out canal systems for purposes of irrigation and development of power.
65.	Minutes of the First Meeting of India - Nepal Joint Standing Technical Committee (JSTC), held on 8-9 December 2008 in New Delhi.	Joint Standing Technical Committee was constituted to rationalize technical committees and sub-committees that exist between India and Nepal related to flood management, inundation problems, and flood forecasting activities, besides projects specific committees on hydropower.

S.N.	Legal Instruments	Key Provisions Related to Water Sector
Orders		
66.	Formation Order of Water and Energy Commission 1992	<p>Review the multipurpose, mega, and medium-scale water resources projects before being endorsed by the GoN, and recommend their implementation as well.</p> <p>Formulate and cause to formulate necessary policies and strategies by conducting studies, research, survey, and analysis concerning various aspects of water resources and energy development in keeping with the priorities and targets of the GoN.</p> <p>Analyze the bilateral or multilateral projects relating to the development of water resources and energy to formulate policies and review the detailed study and analysis of such projects.</p> <p>Enact and causes to enact the necessary laws pertaining to the development of water resources and energy.</p> <p>Establish and causes to establish coordination among national and sectoral policies relating to water resources and the energy sector.</p>
67.	Formation Order on Reformation of National Water Resources Development Council 1997	Council reformed to maximize the use of water resources, bring economic prosperity to the public, establish effective coordination among government agencies, and reform water resources-related policies.
68.	Formation Order of Melamchi Drinking Water Committee 1998	The committee has roles and responsibilities, including implementing public, domestic, industrial, and environmental projects or the availability of other drinking water uses in Kathmandu Valley.
69.	Formation Order of Rural Drinking Water and Sanitation Fund 1996	The fund has been established to maintain sustainable and cost-effective water-related projects, and the committee is to support through economic, technical, and institutional means.
70.	Formation order of Electricity Development Committee Fund 2002	The fund has been established to arrange funds to develop hydropower projects, promote private investment, issue loans to identified hydro projects, fund management, mobilization, operation, etc.
71.	Formation order of Groundwater Resources Development Board 1975	Formed Order under Development Board Act 1956, responsible for identifying potential groundwater areas, policy formulation, planning, and advisory services.

ANNEX B: GAPS AND NEED ASSESSMENT FOR WATER RESOURCES MANAGEMENT IN NEPAL

Water Resources Management Opportunities, Issues, and Constraints

The river basins in Nepal are unique and possess characteristics that define the climate, temperature, water availability, volume of rainfall and discharge, as well as location-specific parameters. These demand proper water resource management approaches to maximize opportunities and minimize issues by well-addressing the constraints. These also demonstrate that water resource management is not purely an engineering solution but rather a complex multidimensional problem requiring the attention of society as a whole.

Opportunities

The development of water resources is primarily viewed as a way to build livelihoods, develop resilience, enhance the socio-economic conditions of society, and develop riverine ecosystems. The primary benefits are:

- Generally rich in water resources with abundant water resources on an annual basis
- Water available for irrigation and enhancing crop productivity and food security
- Hydropower generation and enhancing energy security, and clean energy to provide an impetus for economic development as well as export
- Aquaculture and maintaining traditional fishing livelihoods
- Freshwater for domestic and municipal uses
- Navigation at certain reaches and connectivity to the seas
- Preserving biodiversity and the environment.
- Recreation like rafting and water sports
- Enhancement of cultural and religious tourism activities
- Tourism, trekking, mountaineering
- Potential reservoir sites for multipurpose uses
- Storage locations for downstream flood protection benefits
- Fertile potential irrigation area existing
- Long-term benefits and returns in investments by successful projects, e.g., infrastructure development projects.

Issues

Water resource development has multiple dimensions and repercussions on the country's socio-economic, political, physical, and international ramifications. The common issues in the water resources sector are:

- Extremely varying resources with problems of “too much and too little” water occurring in the same basin as well as across basins
- Low development to date in the water sector suggests limited capability
- Low investment with limited market absorbing capacity
- Challenging investment environment with complex regulations and state control
- Floods, erosion, and sedimentation during the monsoon season

- Possibility of glacial lake outburst floods (GLOF) and landslide block-induced floods in upper reaches
- Climate change impacts and associated complexities and uncertainties
- Complex geology and terrain often limit access
- Data availability and reliability
- Submergence of built infrastructure, agricultural and settlement areas by proposed storage projects
- Indigenous people and their concerns about their native land
- Differential Impacts of development projects on Gender and marginalized communities
- Rehabilitation and resettlement issues
- Water scarcity at some basins and locations at some times
- Inter-basin water diversion
- High seismic risks due to earthquake-prone zone
- Long time required in project planning, development, and accrual of benefits
- Capital intensive projects
- The market for produced energy
- Power evacuation problem
- Multidimensional problems often pose complex problems, including sentiments, equity, and diversity issues.
- Water sector ownership, responsibility, and liability issues among the three tiers of government
- Biodiversity preservation, forest, and conservation areas
- Bilateral agreement with India, its provisions, and downstream water uses
- Construction of hydraulic structures, flood protection embankments, and road/rail embankments on the Indian side and submergence by backflow on the Nepal side
- Skilled resources required in project design, financing, and optimizing, as well as negotiations and promoting public understanding.

Constraints

There are a number of constraints imposed by the physical nature of water resources as well as that driven by public expectation, social welfare, and environmental justice requirements.

- Maintaining a balance between conflicting water uses, traditional practices, and environmental flows.
- Downstream water uses, including within the basin as well across the border with riparian countries.
- High cost of development of water resources projects with longer-term benefits.
- Local indigenous peoples' objection to the construction of high dams.
- High cost of compensation for the affected community.
- Flooding and change of river course in the Terai, risk of embankment breaches.
- Benefit and cost-sharing within the local communities, three-tiered governance system, as well as the riparian countries.

Large-scale developments of irrigation and hydropower are concomitant with broader socio-economic and environmental issues involving the construction of dams, reservoirs, and often the diversion of water from one basin to another. It should be noted that the above-listed opportunities, issues, and constraints suggest the scale of the water resource management problem and the tools required to address it in a manner that is technically possible, economically viable, and socially acceptable to society. Suitable policies and safeguards must be enforced to ensure good practices are adopted, and suitable water resource management approaches are expected to help implement that process.

Gaps and Need Assessment of the water sector

The discussions with the stakeholders and the descriptions stated above were primarily found to be oriented around and narrowed down narratives to the following key areas.

- Gaps and challenges at the policy and regulations level in the water resources sector.
- Institutional issues and challenges while the government gears to address the policies and regulations.
- Implementation challenges and needs observed in water governance.

Policy and regulation level gaps and challenges

Policies centered around and related to water are often found to be complex, sentimental, and highly political. This dictates that water policies and related regulations enforced are often contentious and subject to diverse narratives. These are at the core of the conflict between constituencies due to increasing interests in resource availability, access to funds for and control of development, and promise of future benefits. Water sector policies in Nepal were ideal in principle, but gaps were evident, as highlighted below.

Policies were developed largely in response to international shifts in reforms: It was often noted that the global changes in water policies during the 1990s to early this century advocated IWRM, basin, nexus, and SDGs approaches in water resource management. This ushered in externally demanded changes rather than internally bred concepts in the policy spheres. Some policies also dictated the type of institution to be developed or stripped down to, especially in view of private sector participation and the need to support it, as well as to make the traditional communal or state services to be run like businesses and oriented towards profitability and market economies. This also ushered in issues with ownership and convictions in the approach. Some of the policies in the water and energy sectors are still not concurrent. These were formed before the narrative on climate change was mainstreamed and thus did not explicitly address such issues.

Policies at federal, provincial, and local levels: The recently adopted three-tiered federal structure of governance in Nepal empowers the provincial and local levels of government to make their own policies in a manner specific to their constituencies and mandates. This is supposed to reduce central hegemony and improve access to governance, enhancing service delivery from the system. But this has instead resulted in greater confusion in terms of scope, authority, responsibility, and liability. Fair and acceptable procedures have not been written or clearly established yet. It all originates from the lack of clarity on who owns water, the river stretch, and the associated resource and problems. The provincial and local governing bodies also mimic older days of ruling with impunity and being unanswerable but are also paradoxically at total mercy on the federal government for grants and funds to sustain itself. Mechanisms to redress complaints, smooth out overlapping jurisdictions, and iron out differences require the maturity of the system. An accepted method of sharing costs and benefits is direly needed.

Policies in Silos: Different sectoral policies exist, as they must, under their sectoral mandates. These seemingly different mandates contradict the integrative function of the policies. For example, the overall understood, whether explicit or not, is the development of infrastructures that often transect forested or conservation areas. After careful evaluation of the environmental studies and weighing the cost and benefit, the government directs a particular department or ministry to build the

infrastructure in the forest area. The MOFE policy mandate is the preservation of forests and attempts to block infrastructure development despite being approved and cleared for construction. Both these institutions are enforcing their own sectoral policies and, in the end, end up delaying the project or scuttling it altogether.

Policies developed to consolidate influence: Often, the institution involved in developing and implementing the policy augmented its own importance and influence in the decision-making, power structure, and implementation in ownership. It also meant, more often than not, that the policies remained in silos and were not effective in being integrative in obtaining the desired changes or impacts on society.

Communication and tackling mis- and disinformation in Policies: Policies, whether borne out of external drivers or internal stressors, often fail to gain support due to lack of public ownership and construed narratives catering to a particular group's agenda. For policies to be effective, there has got to be a "demand-driven approach" so that the constituencies believe that it arose out of their demands or necessities. In the present era of instant communication and social platforms, proper dissemination of the policies, their ramifications, and their importance must be carried out to inform all so that misinformation and disinformation do not derail policy efforts. Statements on water rights and tariffs are sensitive issues, and it isn't easy to deconstruct a mindset that has already been convinced otherwise.

Needs on the policy front

The above issues and challenges suggest that the following is needed on the policy front, especially in content.

- Clear demarcation of authority, roles, responsibilities, and liabilities with commensurate fiscal allocation to remove confusion. It is also related to issues with vertical and horizontal policy fragmentations.
- Drafting regulations and legal codes are also required, especially in light of the transition to the three-tiered federal structure. Successive older laws, statutes, and legislations need to be rewritten or revised according to the new Constitution and governance regime not only for the federal levels but also for the provincial and local levels.
- Adopting an integrated water resources management with a basin-wise approach with greater emphasis on climate change adaptation, water storage (harvesting), food security and energy issues, watershed conservation, wetland preservation, etc.
- Clear demarcation on legal rights on water, establishing scenario-based criteria or guidelines for water allocation between federal, provincial, and local levels.
- Establishing custodian of data after setting up national norms on water quality, water usage standards, water release requirements, and a regulatory agency empowered to monitor, evaluate, and sanction uses of water
- Establishing policies to enforce equity in development, reduce regional disparities, and mainstream GESI issues in water resource development. There exist gender inequalities in terms of access, control, and management of water resources, and the policies have not adequately acknowledged these. This requires understanding and mainstreaming concepts of inclusion, equity, and diversity targeting marginalized sections of society, promoting norms and paradigms in socio-economic developments to contextualize approaches towards the broader goals of poverty reduction, sustainability, and enhancing livelihoods.
- Establishing an overall integrative policies monitoring system that identifies time-obstructive policies in silos and facilitates execution of projects that have been duly cleared for implementation. Inter-institutional facilitation and cooperation are much needed.

- Policies should be in tune with the country's situation that can be followed up in tandem with legal and institutional instruments such as well-thought-out action plans, guidelines, and operational directives. Idealistic abstract policies are often not implementable if it is not tied to ground realities and is realistic. The policy may be tied up with higher priorities and 'distractions' rather than enabling required interventions in policies in line with government strategies and plans. For example, the National Water Resources Strategy 2002 and National Water Plan 2005 set in motion a certain direction for the water resources sector, which was supposed to be enabled by enacting suitable policies, legislations but the country's priorities and interests precluded them from giving due attention to the water policies streamlining.

Institutional gaps and challenges

The institutional setup is designed to deliver the policy directives; therefore, they are critical to any country's desired operation. The delivery of services is directed by the policies and mandated by the institution's charter or regulation. Unsurprisingly, the discussions revealed that institutions are key to the successful implementation of policies, and non-performance of institutions would render ineffective even the best-designed or meaning policy. Good policies can evaporate or vanish at lower levels of governance if suitable institutional support and buy-in are not there. The major institutional issues and challenges identified are:

Existence of institutions with dual or confusing mandates: Institutions were often seen to have overlapping roles and conflicting mandates that created confusion and hampered service delivery. Conflicts can also arise and delay project implementation. All three federal, provincial, and local tiers have mandates for developing irrigation and hydropower generation. Each level may develop a particular project, say, hydropower production in a particular location, according to its mandate, resources, and authority. This may lead to under-sizing a development to fit an institution's mandate.

Similarly, who carries out a feasibility study of a mega electricity project may be confusing – is it WECS, MoEWRI, DOED, or the IBN? Which level of organization will a flood-affected victim reach out to? The local authorities, provincial water sector offices, district disaster risk management committees, Federal departments, ministries, or the National Disaster Risk Reduction and Management Authority (NDRRMA) exist.

Such confusion deters cooperation between different institutions and promotes intersectoral competition and possessiveness amongst institutions. Effective coordination mechanisms and supportive mechanisms should be developed to address inter-institution competition.

Concurrent responsibilities of Institutions: Institutions at the federal and provincial levels are conflicted or confused regarding who gets to do what. Traditional approaches of a centric government still exist, and it was seen that whoever held the purse commanded the sphere of activities. This meant that the federal offices were conceived as transgressing province-level boundaries as the federal levels had the budget and provided provincial allocations.

Ideally, the role of the central government is perceived by the provincial perspective to be one of the setting standards, guidelines, and minimum operative policies and no direct on-field activities. The distribution of roles between federal, provincial, and local levels is given in the Constitution's Schedules 5 to 9. Schedule 7 shows concurrent jurisdiction areas of the Federal and Province levels, while Schedule 9 shows the same for all three tiers. The guidance to define sharing of the concurrent powers must be soon defined for all three tiers of government to remove.

Capacities of institutions: The institutional capacities to plan, design, implement, monitor, evaluate, and incorporate learnings are very much needed at the provincial and local levels. Conceptual frameworks of water plans, water budgeting, designing interventions, analyses of flood risks, implementing programs with quality and cost controls, project management, climate adaptation, and resilience incorporation in activities are all areas of expertise that are severely lacking, primarily at the provincial and local levels, if not partially at the central level. Capacities were also limited in terms of personnel, skillsets, physical infrastructure, procedural guidelines, and tools to perform diverse

tasks related to the water sector primarily in the provincial and local levels and to some extent at the federal levels. Decision support systems, operational rules, allocation priorities, and regulatory and enforcing mechanisms are also needed to build capacities and enhance performances.

Ease of access to the public, transparency, and stakeholder consultation: Civil society and the private sector are often kept in the dark and guessing about institutional programs and priorities. Consultation is often limited to lip-service in mandated requirements such as public hearings, environmental examinations, or garnering participatory contributions for the implementation of some programs at the grassroots level. Institutions are often ensconced behind security and bureaucratic procedures that obstructs true public awareness and involvement of stakeholders. Institutions must engage the private sector, social entities, and community organizations to build trust and transparency in their undertakings.

Overwhelming water quality issues in rivers and preserving riverine ecology: The focus till now in Nepal has been water utilization and development, while the quality aspects have deteriorated. Rivers have suffered from waste dumping and sewerage discharges, excessive mining, and increased turbidity of river waters and control haphazard construction in watersheds that deteriorate water quality. There is an urgent need to enforce river water quality protection, enforce conservation of river ecology, and monitor and evaluate environmental flow requirements so rivers are protected and degradation is reversed.

Institutional Needs:

The above issues and challenges point to the need in the water sector to build up institutions geared towards the newly mandated roles envisaged by the Constitution and attempted by shifting policies. The institutions must be strengthened with physical infrastructures, process-related attributes such as procedural guidelines, operational standards, manuals, and a knowledge base to deliver the anticipated product or services. The following are the specific needs at the institutional level:

- Institutions that are geared toward delivering the policy aspirations. For example, the water resources Policy 2020 advocates IWRM approaches in water resources management, but no institutions are clearly formed, mandated, or empowered to implement the IWRM approach.
- Presence of adequate staff with specialist knowledge and experience to guide the institutions in achieving their tasks. This is especially true at provincial and local levels and, to a lesser extent, in federal-level offices. Technical capabilities in building basin plans, water accounting, water budgeting, scenario analyses, and allocation must be improved.
- Incorporation of decision support systems, collecting and curating databases, climate-related information, and training to understand uncertainties, vulnerabilities, and risks at the project and program levels.
- Specific provisions and programs recognizing special needs for disadvantaged groups, gender, and other marginalized communities to promote inclusion and mainstream in socio-economic development. Disaggregated data to reveal information on GESI investments, suitable M&E systems, and indicators are still desired to address gender aspects in water resources management.

Implementation gaps and challenges in water governance

Many aspects of implementation challenges were also identified and discussed. There were already desired policies and institutions in place but the expected activities and outcomes were lacking due to implementation difficulties. These difficulties ranged from abstract policies and statements in government programs that were not in tandem with the implementation mechanism, funds, and support from different sectors.

Scarcity of funds and capital required to implement activities: One of the primary challenges was the scarcity of funds and lack of resources to implement desired programs. More funds are required at the scale and extent to make impacts and achieve targets.

Political will and leadership to champion change: There is a strong need for political will and leadership to champion and lead change to adopt the policy directives and smoothen implementation as entrenched practices resist change, and business as usual may prevail. The polity level needs to be informed so that timely decisions are made. Water decisions eventually ignite public sentiments and concerns, so the political leadership needs to be committed and directed toward achieving the desired goals.

Monitoring and evaluation: It was often noted that projects and programs underperform, get delayed, sidetracked, or even scaled down. This suggests the need for identifying suitable indicators or parameters of performance linked to a monitoring and evaluation framework that enables a learning-based environment for timely intervention, readjusting resource allocations, identifying areas of weaknesses, and taking preemptive or corrective steps to ensure effective project delivery. The M&E framework with suitable parameters and indicators to monitor project implementation and delivery and, on a higher level looking at policy implementation, the status of gender and marginalized communities, and socio-economic impacts would also be required to give impetus to the overall development aspirations.

Public education and stakeholder participation: Implementations suffer when programs do not get broad public support. The stakeholders and civil society must be engaged from the beginning to prevent implementation issues that can derail projects and activities. Water projects have a direct bearing on public sentiments. Thus, broad consultation, education, and information dissemination are essential to gain traction at all government, media, and civil society levels.

Strengthening cross-sectoral linkages and cooperation: Even well-designed programs and projects fail if the implementation does not recognize the importance of multisectoral cooperation and linkages in project delivery. Different departments and agencies need to be roped in to enhance efficiency in project delivery. Examples of well-executed programs, such as some irrigation programs, were cited as having failed to achieve the desired objectives in higher crop productivity due to limitations on concerted efforts from other enabling institutions such as promoting the use of better seeds and fertilizers, credits for farmers to purchase essential inputs or access to markets and storage facilities. Independent hydropower developers had issues getting government clearances in importing construction materials, machinery, and equipment, getting access roads and land acquisitions, solving labor issues, etc.

High variations in water resource availability: Nepal's precipitation is spatially and temporally variable. Depending upon the location, the monsoon-driven weather system drops 70-85% of precipitation within 3-4 months in a year, with dry and cold weather the rest of the time. This translates to extreme flows in rivers with high floods at times and low flows in the winter and spring. Problems of too much and too little water occur at the same location at different times of the year. This requires some storage option to divert water during high flows and release controlled water during low flows so that water is available when required. Some basins are water deficit basins but possess good soil and terrain for agriculture, such as the major portion of the Terai rivers. This requires the diversion of water from water-surplus basins.

Dying and drying up of rivers: Rivers have been overtly exploited and polluted at many stretches, especially those that flow through or are near urban centers. Restoring these rivers and the riverine system requires a concerted multisectoral effort cutting across several disciplines and institutions. While the policy levels are clear about having clean water bodies and sustainable systems, how to go about restoring them is a wicked implementation challenge.

Understanding climate change uncertainties and impacts on design and implementation: Many engineers and project managers stated that climate change was happening and that we must address or adapt to climate change. While there was little way of mitigation that Nepal could do

regarding greenhouse gas reduction, it was necessary to adapt to climate change and build resiliency. Specific knowledge on how to do that is seen to be in demand. The questions reverted were similar to how we can change our designs or programs to be more climate adaptive.

Data on climate change and impacts on water resource at the local scale: It was further revealed in discussions that while it was still difficult to visualize the varying scenarios of climate change, there is still no definitive useful models or assessments of climate change impacts on water resources at the river basin or local scales in Nepal that readily informs the water planner or engineers to make informed decisions. Baseline basin-wise data on water availability, current and projected demands, and the lack of a water use framework that should have set the rules, limits, and procedures for water allocations are unavailable in Nepal.

Accessing climate funding: It follows from the above challenge that the question invariably asked by government officials and development planners included “What specific steps do we need to demonstrate to convey our climate responsiveness and tap into the climate financing that could be available”?

International issues and skills for negotiations: Some water sector issues, especially in terms of inundation along the southern border, sharing of water resources, allocation of benefits and sharing, project designs, etc., required discussions and negotiations with international partners and riparian countries. These required definite skill sets, and often the government was caught off guard or ill-prepared to tackle issues and counter issues raised at the negotiation tables. This also extended to bilateral and multilateral cooperating agencies accessing grants, loans, and funds for development works.

Service delivery issues: Service delivery issues often emanate from unawareness of one’s impact on the overall program’s end result, lack of confidence, and procedural difficulties in implementation. The government sector also lacks sufficient well-designed guidelines and procedural directions in carrying out one’s designated tasks.

Implementation needs

The challenges mentioned above and issues lead to the identification of needs in improving implementation. These can be listed as the following:

- Technical capability in analyzing data, designing interventions, and executing them for better water resource management. There is also a need for sound project management and an M&E framework to anticipate problem areas, identify critical paths and address them well in advance to avoid implementation delays.
- Specific areas of concern were raised in the need to demonstrate how to incorporate climate change parameters in project design and delivery. Hydrological events are stochastic and changing, so variations are inherent in hydrology and how to identify the changes specific to climate change and make the water projects and programs resilient or adaptive to climate change.
- Training government officials in climate adaptation and resilience building.
- Water storage schemes to address the challenge of “too much and too little water” – the seasonal variations in river flows.
- Water diversion schemes from surplus basins to deficit basins to irrigate the Terai lands are needed to enhance productivity, coupled with hydropower generation to optimize hydro project benefits.
- Adopt approaches in encouraging efficiency in water application in irrigation, conveyance, and utilizing groundwater development for quick implementation and supplementary irrigation in large schemes in Terai where tail-enders do not receive adequate water and groundwater is available.

- Installation of shallow tube wells in the Terai region and pumping with solar energy is also required to minimize fossil fuel and relieve small farmers not covered by surface irrigation schemes.
- Adopt new technologies of water tanks, sprinkler irrigation schemes, and drip irrigation schemes where water is limited and high returns are possible with cash crops, vegetable farming, etc.
- Adopt good practices in watershed management, nature-based solutions, and ecosystem-based approaches to enhance sustainability, minimize sediment problems, and improve water quality.
- Downscale and establish climate change scenarios at the basin or local levels, and build guidelines on applying the information for planning and developing water resources projects.
- Prepare baseline basin-wise data on water availability, current and projected demands and perform water auditing.
- Develop a suite of climate adaptation or mitigation measures and smart climate approaches and carry out necessary training specific to the water sector in particular and climate change management and financing in general.
- Train and adopt remote sensing to support water resources management. Hydrological analyses, runoff computations, flow routing, operation of reservoirs, soil moisture assessment, crop coverage and managing agricultural inputs, and improved irrigation management can all be greatly aided by remote sensing and spatial analyses. These can be cost-effective and quick, efficient approaches in water resources management.
- Set up a water use framework that would establish rules and limits on water usage for different scenarios of consumptive and non-consumptive uses.
- Suitable funding arrangements need to be well defined and worked out before initiating projects and improving financial delivery and budgetary allocations.
- Training and exposure visits to educate officials to build their competencies and confidence in project design and delivery.
- Political will and leadership to streamline policy and institutional hassles, rally public support and ensure stable fields for project implementation.
- Stable governments and bureaucracy to support project implementation and stop frequent turnover of responsible officials.
- Well-designed terms of references, guidelines, and procedural manuals for government and technical personnel to enhance service delivery.
- Capacity to monitor and evaluate programs and impacts to institutionalize learning environments and project-specific metrics such as environmental release from dams and diversions, sewage and drain outfalls for pollution control, and water quality discharges for compliance monitoring and other performances routinely.
- Support public and stakeholder engagements, media, and outreach programs to inform and educate citizens and build ownership.

Conclusion

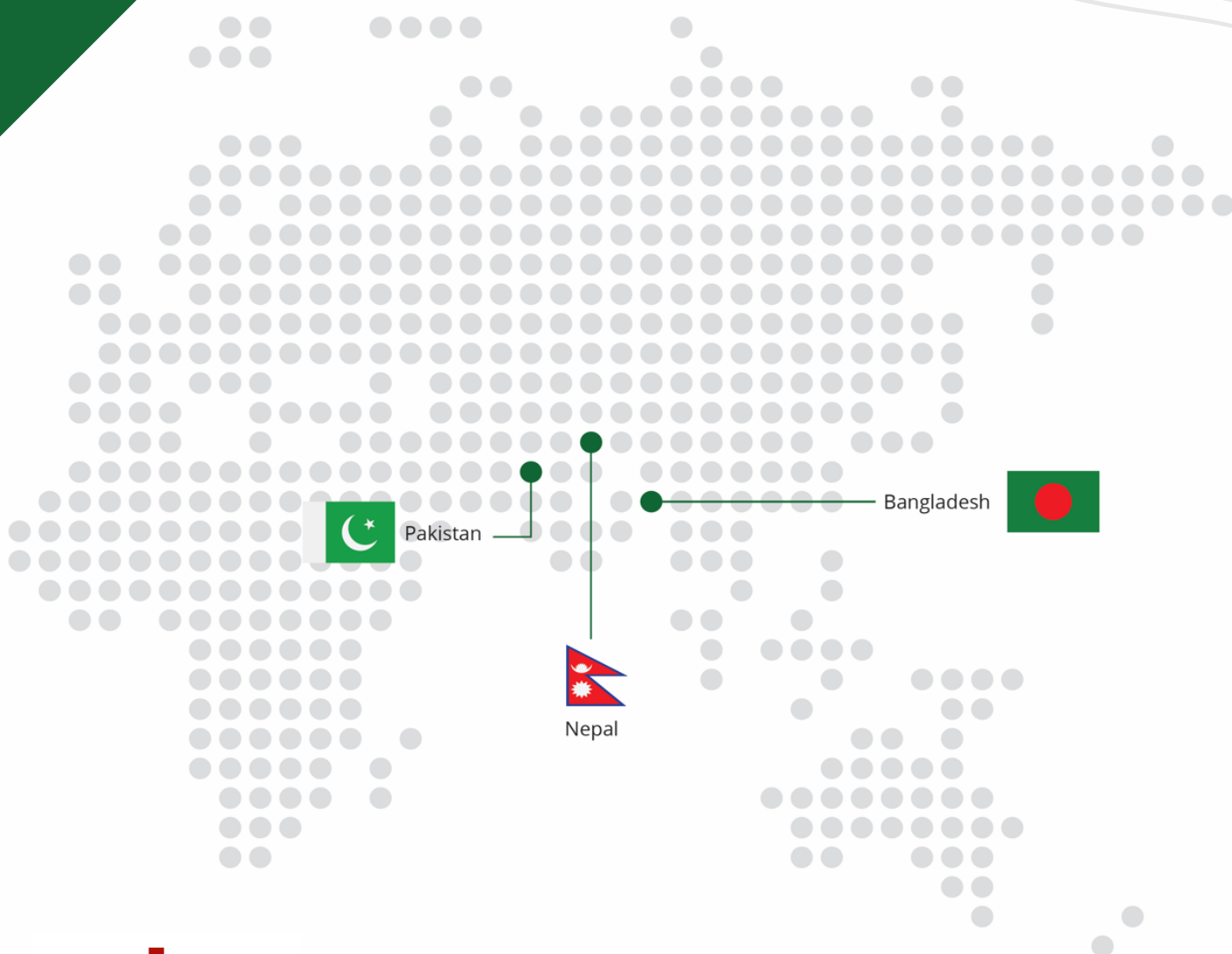
Water resource management in Nepal is a complex issue requiring a multidimensional approach from policy to implementation level changes requiring institutional interventions. In most cases, these are incongruent with the objectives and activities of the CARE for South Asia project.

The findings based on the review and consultations with related officials indicate an overall need for an enabling environment to enact suitable policies and legislations at the federal and other water sector governance levels. This ranges from role and relation demarcation between federal, provincial,

and local authorities regarding water bodies and projects to enforcement of regulations and legal codes as per the new Constitution and mandates, adopting an integrated water resources management with a basin-wise approach with greater emphasis on climate change adaptation to achieve water, energy and food security for the country. The study also emphasizes the need for water accounting to monitor, evaluate, and sanction the uses of water as well as mainstream GESI issues in water resource management.

Besides the need for an enabling environment to enact policy and legislation at all levels of governance, there is a need for capacity development to realign the institutions to deliver policy aspirations and strengthen them with skilled personnel at all levels. The capacity-building efforts should be concentrated in various domains ranging from capability in analyzing data, using disruptive technologies, designing interventions and executing projects by considering climate-related information to understand uncertainties, vulnerabilities, and risks at the project and program levels. Capacity enhancement should also focus on ways to address the challenge of “too much and too little water” to cater to varying demands. Irrigation being a major means of water management in the agriculture sector, there is a need for capacity building on water use efficiency in irrigation, conjunctive use of groundwater in water-scarce systems, and complement with agriculture support services. There is also a need to develop a capacity for climate adaptation or mitigation measures, climate-smart approaches specific to the water sector, and general climate change management and financing.

Though fulfilling the above needs is likely to align the water sector institutions in Nepal to achieve the goal of building resilience to climate change, there is also a need for leadership, stable government, and bureaucracy to streamline policy and institutional hassle along with the political will and public support to ensure stable fields for project implementation.







adpc

Asian Disaster Preparedness Center

SM Tower, 24th Floor, 979/66-70 Paholyothin Road, Phayathai, Bangkok 10400 Thailand

Tel: +66 2 298 0681-92
Fax: +66 2 298 0012
Email: adpc@adpc.net

-  www.adpc.net
-  Asian Disaster Preparedness Center - ADPC
-  @ADPCnet
-  Asian Disaster Preparedness Center - ADPC