Water Sector Roadmap For Implementing Bhutan's NAP

ADB TA-6971 BHU: Fiscal Sustainability and Green Recovery Program

DEPARTMENT OF ENVIRONMENT AND CLIMATE CHANGE
MINISTRY OF ENERGY & NATURAL RESOURCES
THIMPHU; BHUTAN

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1 Introduction

The Water Sector Road Map has been developed to support the funding and implementation of sectoral National Adaptation Plan (NAP) priorities in Bhutan. The country's first NAP was published September 2023, however its development coincided with several significant events:

- Enactment of Civil Service Reform Act of 2022: this resulted in a major reorganization of government agencies along with a shuffling of civil servants.

- Ongoing out migration of professionals from Bhutan. Many governments reported losing staff without having adequate time to hand over responsibilities. As a result, institutional knowledge has been lost that might take years to gain back.

Two further challenges were apparent from the initial review that were confirmed at the working session hosted in Paro:

- Up to 80% of the staff engaged in the NAP review had limited to no experience in developing logframes - a tool that was key in presenting sectoral NAP strategies.

- Many staff also stated that they had limited experience in climate change adaptation. As a result, they were unsure whether or not the proposed activities presented in the NAP were relevant.

The combined impact of these changes meant that, while Bhutan's NAP achieved a major milestone in the country's history, there were gaps in the resulting climate adaptation strategies presented at the sectoral level. This report presents:

- An updated list of water sector adaptation priorities for climate financing
- A resource mobilization strategy (guidelines and donor scan)
- Draft plan to raise the awareness of energy sector stakeholders regarding NAP goals and how it impacts their work.

To support development of this report, a 5-day workshop was held in Paro from December 4-8, 2023. There, staff from lead ministries, received training over two days on how to develop logframes and resource mobilization strategies. A separate capacity development report has been prepared that details training activities.

Based upon this training, a three-day working session was then held where NAP focal points provided inputs to this report. As discussed with the Ministry of Energy and Natural Resources (MoENR) a second phase of reviews will be required to finalize this document for approval. Detailed steps are outlined for his process in the conclusion section of this report.

Preparation of this sectoral road map was supported through the Asian Development Bank's (ADB) project entitled: TA-6971 BHU: Fiscal Sustainability and Green Recovery Program (Subprogram 1).

2 Water Sector Roadmap

2.1 Gap Analysis

Bhutan completed its first NAP in 2023. To support implementation, a review was undertaken of proposed strategic objectives, outcomes, actions and activities with a focus on three sectors: agrifood, water and renewable energy (RE). This entailed:

- Revisiting stated program priorities
- Clarifying proposed activities and their link to adaptation goals
- Establishing inter-sectoral linkages by identifying other ministries and stakeholder required for implementation.

As a result of this work a number of opportunities were identified for strengthening future NAPs exercises. They include:

1. Providing definitions for terms like strategic outcomes, strategic objectives and strategic actions and activities to ensure consistent application across sectors.

2. Using a logframework approach (as applied in this report) to support coherent program development.

3. Making explicit links between proposed activities and other sectors.

4. Identifying institutional responsibilities and implementation partners with proposed activities.

5. Identifying if proposed activities are new, or part of existing programs (this makes it difficult to ascertain funding needs).

Specifically with regard to the existing Water Sector many of the objectives and activities included in the NAP are well thought. However there remains several opportunities for strengthening the proposed body of work:

Goal Statement: The water sector NAP currently lacks a unifying climate adaptation goal for the sector – as a result the 5 stated strategic objectives potentially lack cohesion. A draft goal statement follows:

- Goal: Enhance the climate resilience of Bhutan's water sector while achieving equitable, sustainable water allocation among competing sectors by 2040.

Additional Objectives & Activities: Bhutan's Water NAP Sector presents several very good objectives and activities. However, there are opportunities for strengthening the proposed body of work. For instance:

- No reference was made to assessing the state of implementation of Bhutan's national IWRM plan developed in 2016 with support from ADB.

- Water efficiency references are either too generic or focused on agriculture. No reference is made to improving efficiencies in buildings, industrial practices, household use or in water management practice of hydroelectric dams.

- Activities related to water governance tend to focus on increasing the capacity of WUAs rather than addressing capacities at all levels.

- Activities to ensure the environmental sustainability of water sources could be strengthened to ensure natural systems have adequate flows of water, and regular assessments could be undertaken to monitor ecosystem health.

- Activities related to developing and implementing a Disaster Preparedness Plan for the Water Sector could be strengthened in several ways, including making specific reference to community engagement and development of a disaster preparedness plan.

- Activities related to strengthening water quality management to protect public health could be strengthened by increasing public awareness around the importance of clean/potable water and the link to health. In addition, activities that reduce impacts from industry and agriculture on water quality could be included.

2.2 Proposed Water Sector Roadmap

Table 2.1 on the following page presents a proposed Water Sector Roadmap to support both immediate and long-term implementation of Bhutan's climate adaptation priorities. NAP sector focal points were engaged to develop a modified set of objectives and activities that addresses the gaps identified, while incorporating the original activities presented in Bhutan's Water Sector NAP. The table employs a simplified logframework that should facilitate development of future projects and funding. Attachment 1 provides guidance on how to develop a monitoring and evaluation strategy to support implementation.

There benefits of using this approach include:

1. It provides a comprehensive framework objectives and activities required to achieve the sectoral climate adaptation goal. Many governments fail to do this when developing their first NAP – focusing instead on favored, immediate projects.

2. Not all objectives or activities have to be funded immediately, but understanding how they work together to achieve the broader goal will help prioritize what gets funded first.

3. It helped identify additional activities that were inadvertently omitted when developing the NAP. Some of these were under development at the time when the NAP was prepared.

The resulting logframework shown in Table 2.1 will require a second round of reviews to solicit inputs from (i) other departments, (ii) other sectoral government agencies, (iii) stakeholders in business, CSOs,

Table 2.1 Proposed Water Sector Roadmap

Challenge: The vulnerability of water resources is identified as one of the major climate risks in Bhutan and will affect all sectors, from food production, energy, human settlements, and the industry.[1]			
Goal: Enhance the climate resilience of Bhutan's water sector while achieving equitable, sustainable water allocation among competing sectors by 2040.			
Objective	**Activities**	**KPIs**	**Risks**
Objective 1: Strengthen Water Governance	1.1 Amend existing water policies, laws, and regulations to incorporate emerging climate issues and challenges in the water sector. • Medium Term Activity 1.1 Effective implementation of water legislation and IWRM.	The number of policies and regulations reviewed and updated. Number of strategies / action plans developed for addressing emerging issues and challenges.	Regulatory changes may face legal challenges or political pushback. Lack of capacity to undertake policy amendments. Slow legislative processes may delay the implementation of new policies.
	1.2 Assess and update progress of Bhutan's NIWRM 2016 Plan • Evaluate the progress of plan to identify gaps and understand the impact of changing water demand and supply patterns. • Conduct stakeholder outreach to help provide feedback and gather input on progress reporting of NIWRM 2016. • Update Bhutan's IWRM hydrological models with the latest data on climate change, population	Performance report complete. No. of stakeholder meetings Diversity of stakeholders No of updated models that integrate new data.	NIWRM does not adequately address climate risks/resilience issues. Incomplete or outdated data impacts analysis. Some stakeholders not represented. Consultation fatigue

[1] Bhutan's NAP 2023 page 50

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Objective	**Activities**	**KPIs**	**Risks**
	growth, economic development, and technological advancements to refine water allocation projections. • Create a detailed implementation roadmap with clear milestones, responsibilities, and a timeline to guide the phased execution of the updated IWRM plan. **Strategic Action: 2.1 River Basin Planning** ● Short Term Activity 2.2 Carry out River basin management and planning for basin optimization. Medium Term Activity 2.2 Monitoring and evaluation of river basin management plan	Alignment of models and observed trends. Development of a detailed roadmap with established milestones. Percentage of roadmap milestones achieved on schedule.	Projections inaccurate, leading to ineffective water allocation strategy. Unforeseen events render new projections obsolete. Delays in roadmap development could slow update of IWRM. Lack of accountability or resources might lead to missed milestones.
	1.3 Strengthen research on water resource management including groundwater resources. ● Short Term Activity 3.1.1 Research on water resource management including groundwater resources and soil moisture. ● Short Term Activity 3.1.2 Enhance hydrological and groundwater modelling.	Number of groundwater resource and soil moisture assessments conducted. Number of advanced hydrological and groundwater models developed. Number of feasibility studies conducted for rain harvesting.	Inadequate data collection methods could lead to incomplete or inaccurate assessments of groundwater and soil moisture. Complex geological formations and aquifer dynamics may impede

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Objective	**Activities**	**KPIs**	**Risks**
	● Short Term Activity 3.1.3 Carry out studies on the options for household/institution level rainwater harvesting or creating additional water storage capacity. ● Short Term Activity 3.1.4 Assess climate risk on water intensive industries (168 water intensive industries as of 2022) ● Medium Term Activity 3.1.1 Initiate use of groundwater or discontinue based on findings from the study.	Number of institutions with additional water storage facilities. Climate risk assessment report on water intensive industries.	accurate hydrological and groundwater modeling. Low adoption or interest in rainwater harvesting due to cultural preferences or misconceptions about its effectiveness. Difficulty in engaging with all water-intensive industries, particularly if they perceive climate risk assessment as non-essential or a regulatory burden.
Objective 2: Strengthen Stakeholder Engagement	2.1: Establish/strengthen water user associations (WUA) to enable community engagement in water allocation decisions. **Strategic Action 5.1 Strengthening Water User Associations (WUAs).** ● Short Term Activity 5.1.1: Review and strengthen WUAs. ● Short Term Activity 5.1.2: Implementation of WUA guidelines.	Endorsement of WUA guideline Number of WUAs established. Number of training sessions conducted on IWRM, WUA formation, and responsibilities of WUA in water conflict management.	There may be low community engagement due to lack of awareness. WUA may not accurately represent all community interests.

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Objective	**Activities**	**KPIs**	**Risks**
	• Short Term Activity 5.1.3: Training on IWRM, formation of WUA and legalization, (management, accounting, etc.). • Medium Term Activity 5.1.1 Monitoring and evaluation of WUAs.	Number of functional WUA that are formally registered	
	2.2: Institutionalize training for water managers, WUA chairman, and policymakers in conflict resolution and adaptive management.	Number of managers and policymakers trained annually. The frequency of conflicts resolved without escalation.	Training may not be effectively applied in real-world situations. Water managers and policymakers may be resistant to adopting new practices.
	2.3: Create/strengthen transparency mechanisms for water allocation decisions to ensure all stakeholders are informed.	The number of transparency mechanisms implemented (e.g., online platforms, public reports). Stakeholder satisfaction rate with the transparency of the water allocation process.	Too much information can overwhelm stakeholders, reducing the effectiveness of transparency mechanisms. Stakeholders might misinterpret information, leading to mistrust or conflict.

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Objective	**Activities**	**KPIs**	**Risks**
	2.4: Regularly update and involve stakeholders and communities in the water allocation plans to reflect changing needs and priorities. **Strategic Action 5 c** Enhancing capacity of key stakeholders in managing the impacts of climate change on water	The frequency and regularity of water allocation plan updates provided to stakeholders. The level of community involvement in the planning updates, measured by participation rates.	Water allocation plans may not be updated regularly enough to reflect rapid environmental or social changes. Community interest in participation may wane over time or become focused on short-term interests.
Objective 3: Enhance Water Use Efficiency And Reduce Water Loss Across All Sectors	3.1 Upgrade and maintain water infrastructure to reduce water loss. **Strategic Objective 3** Short Term Activity 3.3.1 Study of NRW in critical urban and semi-urban areas. Medium Term Activity 3.3.1 Implementation of improvements to reduce NRW through active leakage control, pressure management, infrastructure management, water metering, treatment and distribution systems.	Reduction of water loss through leaks or inefficiencies by a set percentage (e.g., 20%) across the water distribution network within a specified timeframe (e.g., five years). Number of smart water management technology systems adopted and implemented.	Potential underestimation of the scale and complexity of required infrastructure upgrades could lead to insufficient resource allocation and project delays. Sustainability risks of technology used due to operational and maintenance cost. Inadequate expertise for using the technology

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	3.2 Improve irrigation management practices to reduce agricultural water consumption. **Strategic Objective 2** Strategic Action 2 Promotion of water efficient technologies Short Term Activity 2.1 Enhance research and development on water efficient technologies. Short Term Activity 2.2 Conduct advocacy on water efficient technologies	Percentage reduction in water consumption per hectare of agriculture land. Number of farmers adopting advanced irrigation techniques. Number of climate proof irrigation schemes developed. Number of lift irrigation systems initiated Database on irrigation system developed Number studies conducted on water efficient technologies	Farmers may be resistant to adopting new technologies due to cost or complexity. Drought conditions could negate the efficiency gains from advanced irrigation practices.
	3.3 Incentivize industries to reduce water use and increase recycling practices through tax breaks or subsidies. Strategic Action 2 Promotion of water efficient technologies ● Short Term Activity 2.1 Enhance research and development on water efficient technologies.	Amount of industrial water use reduction year-over-year. Number of industries participating in the subsidy or tax break program. Number of industries with effluent water treatment systems for water re-use	Industries might lack the knowledge or technology to effectively reduce water usage. Subsidies or tax breaks might not be sufficient to motivate industries to change practices.

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Objective	**Activities**	**KPIs**	**Risks**
	• Short Term Activity 2.2 Conduct advocacy on water efficient technologies	Number of advocacy programs on efficient water use and technologies targeting industries	
	3.4 Promote water efficient domestic use awareness campaigns.	Number of advocacy programs on efficient water use and technologies targeting households. Volume of water saved using efficient appliances and fixtures.	Consumers may not prioritize water efficiency when choosing appliances due to higher costs or lack of awareness.
	3.5 Introduce stricter building codes that mandate water-saving technologies in new constructions and major renovations, prioritizing government owned facilities first.	The number of buildings (existing and new) compliant with updated water-saving codes. Estimated annual water savings resulting from new building codes. Number of buildings with rainwater harvesting systems	Pushback from construction and real estate industries concerned about increased costs. Difficulty in enforcing the new codes, especially in regions with less regulatory oversight.
	3.6 Optimize water release schedules from hydroelectric dams to align with periods of peak power demand, minimizing unnecessary water	Track the percentage increase in megawatt-hours generated per cubic meter of water	The risk that hydroelectric facilities may not be able to quickly adjust water

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	spillage and improving the water-use footprint of power generation.	released to gauge improvements in efficiency. Measure the percentage of time that hydroelectric power generation aligns with peak power demand periods, indicating successful load matching.	releases to match fluctuating power demands due to technical or operational constraints. The potential negative impact on downstream ecosystems due to altered water release patterns, which could disrupt habitats and affect biodiversity.
Objective 4: Invest in Water Allocation Monitoring and Enforcement Mechanisms	4.1 Develop and deploy a network of water usage sensors and gauges across critical points in water distribution networks.	The number of sensors and gauges installed and operationalized within the network. Percentage coverage of the water distribution network by the sensor network.	Malfunctions or failures in the sensors could lead to gaps in monitoring. High initial cost may deter in establishing the monitoring networks. Sensors and gauges are subject to risks of damage or tampering.
	4.2 Set up a centralized database to monitor water allocations and usage in real time.	The operational status of the centralized database, aiming for 99.9% uptime.	Data Integrity Risk: Risk of erroneous data due to input errors or system bugs.

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Objective	**Activities**	**KPIs**	**Risks**
		The accuracy and timeliness of data on water usage reported by the system.	The database may be susceptible to cyber-attacks or unauthorized access.
	4.3 Ensure compliance with water allocation policies, including the capacity to impose penalties on non-compliance.	The number of compliance checks conducted by the relevant agencies annually. The rate of non-compliance cases successfully resolved or penalized.	Insufficient resources or authority to enforce policies effectively. Stakeholders may resist compliance.
	4.4 Conduct regular reviews of water allocation efficiency and adjust policies based on data-driven insights.	Number of policy adjustments made based on review findings. Improvement in water allocation efficiency following policy adjustments.	Inefficient decision-making due to over-analysis of data. Stakeholders may be resistant to policy changes based on review findings.
Objective 5: Ensure the Environmental Sustainability of Water Sources	5.1 Implement ecosystem-based management practices that support the sustainability of water resources. **Strategic Action 1.2**: Strengthen and upscale payment of ecosystem services (PES).	Number of water sources managed through NbS Area brought under effective watershed/wetland management.	Difficulty in effectively implementing and enforcing management practices.

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Objective	**Activities**	**KPIs**	**Risks**
	• Short term activity 1.2.1 Strengthen and upscale PES. • Short term activity 1.2.2 Review PES framework and field guide	Number of PES schemes established. Number of sites managed under spring shed interventions. Changes in the health indicators of water bodies (e.g., biodiversity levels, water quality).	Stakeholders, particularly those from industry, might resist changes that affect their operations.
	5.2 Mandate environmental flow requirements in water allocation to preserve aquatic ecosystems	Compliance rate with environmental flow requirements. The health of aquatic ecosystems as indicated by species population and diversity metrics.	Risk that water users will not adhere to flow requirements, especially during periods of scarcity. Potential for economic activities to be affected by the limitations imposed, leading to resistance.
	5.3. Carry out water resources assessments/inventory at regular intervals to monitor the flow volume and water quality	The frequency and number of environmental impact assessments conducted. Trends in key environmental indicators resulting from assessment findings (e.g.,	Risk of incomplete or inaccurate assessments leading to poor policy decisions.

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Objective	**Activities**	**KPIs**	**Risks**
		pollutant levels, ecosystem vitality). Status report on water resources from the inventory	Insufficient resources available for regular and thorough assessments.
	5.4 Rehabilitate and protect critical watersheds and aquifers to ensure long-term water availability. ● Short Term Activity 1.1 Assessment of wetlands, watersheds and spring sheds and development and implementation of intervention measures. ● Short Term Activity 1.2 Integrating of existing watershed management interventions into Local Area Plans/settlement plans and its implementation ● Short Term Activity 1.3 Restoration of existing water sources. ● Short Term Activity 1.4 Implement ecosystem-based adaptation measures to restore degraded watersheds and watersheds impacted by water scarcity ● Medium Term Activity 1.2 Implement springshed management for sustainable management of wetlands, watershed, and spring sheds.	The area of watersheds and aquifers under rehabilitation and protection measures. Improvements in water quality and quantity metrics post-rehabilitation. Number of assessments carried out for wetlands, watersheds and springsheds for designing and implementation of interventions. No of local area plans/settlement plans with watershed management plan incorporated Number of drying water sources managed under source revival measures	Risk that rehabilitation projects may not be executed efficiently or effectively due to technical or funding issues. Local communities may not support or engage in rehabilitation efforts, reducing their effectiveness. Insufficient funding available to support rehabilitation/protection efforts. Lack of experts for modelling which may lead to incorrect findings Lack of community ownership/maintenance.

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Objective	**Activities**	**KPIs**	**Risks**
	• Medium Term Activity 1.3 Conduct watershed modelling for designing of management interventions, monitor watershed quality, resource allocation and budgeting. • Medium Term Activity 1.4 Monitor infiltration, water buffers, fast runoff, and erosion in important watersheds (degraded/critical) in water scarce regions.	Complete national wetland inventory Number of watershed models developed for resource allocation and monitoring the health of watersheds. Number of degraded watersheds brought under effective management	
Objective 6: Develop and implement a disaster management plan for the water sector	6.1: Map and model water resource vulnerabilities to anticipate and mitigate the impacts of climate-induced disasters such as floods and droughts.	Completion of vulnerability maps and models for 100% of designated water resources by a set date.	Inaccurate data collection could lead to ineffective modeling
	6.2 Develop disaster management plan and guidelines for water sector	Completion of plan	Under resourced for implementation
	6.3: Upgrade infrastructure with climate-resilient materials and design flood barriers and water storage facilities to withstand extreme weather events. • Short Term Activity 2.1 Conduct feasibility studies to build emergency storage, bypasses, and controlled releases from glacial lakes.	Number of infrastructure projects completed annually that meet climate resilience standards. Number of feasibility studies conducted for building emergency storage facilities.	Project cost and time overruns due to unforeseen issues with construction or material supply.

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Objective	**Activities**	**KPIs**	**Risks**
	● Medium Term Activity 2.1 Build emergency storage, bypasses and controlled releases from glacial lakes if found feasible. **Strategic Action 3.2 Harvesting rainwater/fog for domestic use** ● Short Term Activity 3.2.1 Exploring volume of rainwater generated at water stressed areas for domestic use. ● Short Term Activity 3.2.2 Developing assessment guide for integration of holistic use of water resources ● Medium Term Activity 3.2.1 Integrating rainwater/fog harvesting structures into buildings and other amenities. **Strategic Action 4.1 Improve planning, designing and implementation of climate resilient irrigation infrastructures and systems,** ● Short- and Medium-Term Activity 4.1.1 Climate proofing of the irrigation facilities (HDPE/concrete)	Volume of rainwater harvested and used for various purposes.	

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Objective	**Activities**	**KPIs**	**Risks**
	• Short Term Activity 4.1.2 Exploring alternative means of irrigation (solar pumps and lift irrigation) **Strategic Action 4.2 Strengthen database/inventory on irrigation schemes.** • Short Term Activity 4.2.2 Development of irrigation schemes database system • Medium Term Activity 4.2.2 Conduct modelling and simulations of discharge for proposed irrigation schemes		
	6.4 Enhance capacity of key stakeholders in responding to climate change disasters that impact the water sector: • Conduct regular community drills. • Establish local disaster response teams equipped with the necessary tools and training for rapid water system repair and restoration. • Short- and Medium-Term Activity 6.4.1: Capacity development on climate resilient water infrastructures • Short Term Activity 6.4.2: Training onsite inspection, Aerial survey using Drones and mapping using GIS.	Bi-annual drills conducted in all high-risk communities with at least 80% community participation. Training and capacity-building programs delivered to at least 90% of identified key stakeholders within five years. A measurable improvement in climate resilience in water management practices, as evidenced by at least a 25% increase in the implementation of adaptation	Lack of motivation or engagement in capacity enhancement programs from key stakeholders. Lack of baseline data to measure capacity improvements in climate resilience practices. Resistance to changing established water management practices (especially if the benefits of adaptation are not immediately clear).

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Objective	**Activities**	**KPIs**	**Risks**
	• Short Term Activity 6.4.3: Capacity development of flood and storm water management from river flooding and urban floods. • Short Term Activity 6.4.4: Capacity development to generate forecast information at sub-basin level so that early warning information is disseminated on timely basis to all sectors /communities at suitable temporal (Daily to seasonal) and spatial (from river basin to sub-catchment) scale. • Medium Term Activity 6.4.a: (Forecast) Information disseminated on timely basis to all sectors/ communities. • Medium Term Activity 6.4.b: A robust real to near real time information dissemination system with customizable to requirements of different sectors. • Short Term Activity 6.4.5: Build capacity for decision making and management. • Medium Term Activity 6.4.5 a: Continuous updates for technology and refresher training.	strategies by these stakeholders within three years. Development and dissemination of a comprehensive climate adaptation toolkit for water management, to be utilized by 100% of the stakeholders by the end of third year.	
Objective 7: Strengthen Water Quality Management	7.1: Ensure proper monitoring, planning and supply of drinking water	Real-time water quality monitoring systems installed	Technological failures could lead to gaps in monitoring.

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Objective	**Activities**	**KPIs**	**Risks**
to Protect Public Health	**Strategic Action 3.1 Ensuring proper monitoring, planning and supply of drinking water** ● Short Term Activity 3.1.1 Assessing the efficiency of existing water treatment facilities and water supply network systems. ● Short Term Activity 3.1.2 Explore alternative water supply technologies. ● Short Term Activity 3.1.3Expand the implementation of Water Safety Plans (WSPs) and proper water supply systems with adequate design. ● Short Term Activity 3.1.4 Provide training on plumbing water management and other related skills. ● Short Term Activity 3.1.5 Develop operation and maintenance guideline and standards. ● Medium Term Activity 3.1.1Explore and improve water treatment and supply network systems with proper management mechanisms. ● Medium Term Activity 3.1.2 Explore and build additional storage facilities.	in 100% of critical control points. Number of smart water management technologies used Achievement of a 100% rate of scheduled water quality assessments and compliance with drinking water standards across all public water systems within five years.	Inadequate infrastructure or expertise to consistently monitor and manage water supply systems, leading to potential non-compliance.

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Objective	**Activities**	**KPIs**	**Risks**
	Strategic Action 3.3 Strengthen drinking water quality monitoring and surveillance. ● Short Term Activity 3.3.1Expand Strengthening laboratory services to test and monitor water quality ● Medium Term Activity 3.3.1Explore Strengthening water quality and monitoring information systems. **Strategic Action 3.4 Strengthen database/inventory on drinking water supply schemes** ● Medium Term Activity 3.4.1. Establishment of a real time water supply monitoring system		
	7.2: Launch public awareness campaigns on the importance of water conservation and the impact of pollution on health, targeting both urban and rural populations. Strategic Action 3.1 Ensuring proper monitoring, planning and supply of drinking water. ● Short Term Activity 3.1.4 Awareness programs for efficient water use.	Number of campaigns launched. Reach 90% of the target population with water conservation and pollution prevention messaging within three years.	Public messaging may not effectively change behaviors. Inadequate funding and support for campaigns

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Objective	**Activities**	**KPIs**	**Risks**
	7.3: Introduce incentives for industries and agriculture to adopt cleaner processes and environmentally friendly practices that reduce water contamination.	At least a 30% increase in the adoption of sustainable practices by targeted industries and agricultural businesses within five years.	Lack of uptake due to insufficient incentives or awareness.

2.3 Risk Management Strategy

The Water NAP program has several risks that can be managed through program implementation. The objectives and activities detailed in the previous section are likely to be more fully developed into individual projects with higher levels of detail provided. However, for those risks identified a range of mitigation measures are outlined that can reduce unnecessary exposure to these risks.

Objective 1: Strengthen Water Governance

Activity	Risk	Mitigation Measure
1.1: Amend existing water policies, laws, and regulations to incorporate emerging climate issues and challenges in the water sector.	Regulatory changes may face legal challenges or political pushback. Slow legislative processes may delay the implementation of new policies.	Pre-assess potential legal and political challenges and develop strategies to address them. Engage with policymakers early and throughout the process to ensure timely revisions
1.2: Assess and update progress of Bhutan's NIWRM 2016 Plan	NIWRM does not adequately address climate risks/resilience issues. Some stakeholders not represented. Consultation fatigue Assessment delays implementation	Ensure climate risks to water sector are adequately integrated with revised NIWRM. Develop gender strategy and a stakeholder map. Streamline consultation process. Assign a dedicated team and resources. Monitor progress
1.3: Strengthening research on water resource management including groundwater resources.	Inadequate data collection methods could lead to incomplete or inaccurate assessments of groundwater and soil moisture. Complex geological formations and aquifer dynamics may impede accurate hydrological and groundwater modeling. Low adoption or interest in rainwater harvesting due to cultural preferences or	Use state-of-the-art data collection technologies and ensure the training of research teams in their use. Establish data-sharing agreements with regional and international bodies to enhance data quality. Involve experts in geology and hydrology in the model development process and validate models with historical data and peer review. Implement targeted awareness campaigns and demonstrations of

Activity	Risk	Mitigation Measure
	misconceptions about its effectiveness. Difficulty in engaging with all water-intensive industries, particularly if they perceive climate risk assessment as non-essential or a regulatory burden.	successful rainwater harvesting systems to increase acceptance. Provide subsidies or incentives to encourage the adoption of these systems. Work collaboratively with industry stakeholders to communicate the importance of climate risk assessment, highlighting potential cost savings and risk mitigation benefits. Offer technical and financial assistance to facilitate these assessments.

Objective 2: Strengthen Stakeholder Engagement

Activity	Risk	Mitigation Measure
2.1: Establish/strengthen water user associations (WUA) to enable community engagement in water allocation decisions.	There may be low community engagement due to lack of awareness. WUA may not accurately represent all community interests.	Implement community outreach and education programs to increase engagement. Ensure diverse representation on councils through quotas or rotational seats.
2.2: Train water managers, WUA members, and policymakers in conflict resolution and adaptive management.	Training may not be effectively applied in real-world situations. Water managers, WUA members and policymakers may be resistant to adopting new practices.	Offer hands-on, scenario-based training to improve practical skills. Create a support network for trained professionals to encourage adaptive management practice.
2.3: Create transparency mechanisms for water allocation decisions to ensure all stakeholders are informed.	Too much information can overwhelm stakeholders, reducing the effectiveness of transparency mechanisms. Stakeholders might misinterpret information, leading to mistrust or conflict.	Design information dissemination strategies that are clear, concise, and targeted to different stakeholder groups. Provide explanatory materials and sessions to help stakeholders understand complex information.

Activity	Risk	Mitigation Measure
2.4: Regularly update and involve communities in the water allocation plans to reflect changing needs and priorities.	Water allocation plans may not be updated regularly enough to reflect rapid environmental or social changes. Community interest in participation may wane over time or become focused on short-term interests.	Establish a routine schedule for reviewing and updating water allocation plans. Use engagement techniques like public forums, surveys, and workshops to maintain active community involvement.

Objective 3: Enhance water use efficiency and reduce water loss across all sectors.

Activity	Risk	Mitigation Measure
3.1: Upgrade and maintain water infrastructure to reduce water loss	Potential underestimation of the scale and complexity of required infrastructure upgrades could lead to insufficient resource allocation and project delays. Sustainability, operational and maintenance cost of the technology used. Inadequate expertise in using the technology	Conduct a comprehensive audit of the current water distribution system to identify critical areas in need of upgrade. Implement a phased approach to infrastructure upgrades, prioritizing areas with the highest rates of water loss, and ensure adequate budgeting and resource planning. Regular maintenance schedules should also be put in place to sustain the gains made from the upgrades. Explore financing options through proposal development. Capacity building on the use of technology and maintenance
3.2: Implement advanced irrigation management practices to reduce agricultural water consumption.	Farmers may be resistant to adopting new technologies due to cost or complexity. Drought conditions could negate the efficiency gains from advanced irrigation practices.	Provide training and support to farmers for transitioning to new technologies. Offer financial assistance or subsidies to offset the initial investment costs
3.3: Incentivize industries to reduce water use and increase recycling practices	Industries might lack the knowledge or technology to effectively reduce water usage.	Facilitate partnerships between industry and water efficiency technology providers.

Activity	Risk	Mitigation Measure
through tax breaks or subsidies.	Subsidies or tax breaks might not be sufficient to motivate industries to change practices.	Adjust the financial incentives based on feedback and participation rates to ensure they are compelling.
3.4: Promote the use of water-efficient appliances and fixtures in domestic settings through awareness campaigns and rebate programs.	Consumers may not prioritize water efficiency when choosing appliances due to higher costs or lack of awareness. The rebate program may not be adequately advertised to reach a significant portion of the target population.	Provide clear information on the long-term savings and environmental benefits of water-efficient products. Implement a comprehensive marketing strategy for the rebate program, utilizing social media, local news, and community events.
3.5: Introduce stricter building codes that mandate water-saving technologies in new constructions and major renovations.	Pushback from construction and real estate industries concerned about increased costs. Difficulty in enforcing the new codes, especially in regions with less regulatory oversight.	Engage with industry stakeholders during the drafting of new codes to ensure practical and achievable standards. Implement robust inspection and enforcement mechanisms to ensure compliance with new building codes.
3.6 Integrate Hydroelectric Power Management	The risk that hydroelectric facilities may not be able to quickly adjust water releases to match fluctuating power demands due to technical or operational constraints. The potential negative impact on downstream ecosystems due to altered water release patterns, which could disrupt habitats and affect biodiversity.	Enhance dam infrastructure with modern control systems and flexible operational capabilities to better handle variable release schedules. Perform regular environmental impact assessments and adjust water release protocols to ensure the sustainability of downstream ecosystems.

Objective 4: Invest in Water Allocation Monitoring and Enforcement Mechanisms

Activity	Risk	Mitigation Measure
4.1: Develop and deploy a network of water usage sensors and gauges across critical points in water distribution networks.	Malfunctions or failures in the sensors could lead to gaps in monitoring.	Implement redundancy within the sensor network and conduct regular maintenance checks.

Activity	Risk	Mitigation Measure
	Sensors and gauges are subject to risks of damage or tampering. High initial cost may deter in establishing monitoring networks	Secure sensor installations and use tamper-proof designs to prevent interference. Robust awareness programs and explore funding with donors and development partners
4.2: Set up a centralized database to monitor water allocations and usage in real time.	Risk of erroneous data due to input errors or system bugs. The database may be susceptible to cyber-attacks or unauthorized access.	Regularly audit and validate data entries for accuracy and establish data correction protocols. Invest in robust cybersecurity measures, including regular security audits and access controls.
4.3: Establish a task force to ensure compliance with water allocation policies, including the capacity to impose penalties on non-compliance.	The task force may not have sufficient resources or authority to enforce policies effectively. There may be pushback or non-cooperation from those being monitored.	Ensure the task force is well-funded, trained, and has clear legal authority. Engage with stakeholders to build understanding and support for compliance efforts.
4.4: Conduct regular reviews of water allocation efficiency and adjust policies based on data-driven insights.	Inefficient decision-making due to over-analysis of data. Stakeholders may be resistant to policy changes based on review findings.	Set clear guidelines for decision-making timelines following reviews to avoid delays. Create inclusive forums where stakeholders can discuss and provide input on potential policy adjustments.

Objective 5: Ensure the Environmental Sustainability of Water Sources

Activity	Risk	Mitigation Measure
5.1: Implement ecosystem-based management practices that support the sustainability of water resources	The number of water bodies managed under ecosystem-based management practices. Changes in the health indicators of water bodies (e.g., biodiversity levels, water quality).	Difficulty in effectively implementing and enforcing management practices. Stakeholders, particularly those from industry, might resist changes that affect their operations.
5.2: Mandate environmental flow requirements in water allocation to preserve aquatic ecosystems.	Compliance rate with environmental flow requirements.	Risk that water users will not adhere to flow requirements, especially during periods of scarcity.

Activity	Risk	Mitigation Measure
	The health of aquatic ecosystems as indicated by species population and diversity metrics.	Potential for economic activities to be affected by the limitations imposed, leading to resistance.
5.3: Conduct water resources inventory at regular intervals to monitor the flow volumes and water quality	Risk of incomplete or inaccurate assessments leading to poor policy decisions. Sufficient resources may not be allocated for regular and thorough assessments.	Ensure assessments are conducted by qualified professionals and include peer review processes. Secure long-term funding and resource allocation for environmental impact assessments.
5.4: Rehabilitate and protect critical watersheds and aquifers to ensure long-term water availability.	Risk that rehabilitation projects may not be executed efficiently or effectively due to technical or funding issues. Local communities may not support or engage in rehabilitation efforts, reducing their effectiveness. Inadequate financing for rehabilitation and protection activities. Lack of expertise for modelling. Lack of community ownership/maintenance	Develop comprehensive project plans with expert input and secure funding before implementation. Involve local communities from the planning stage, offering education on the benefits of rehabilitation and protection efforts. Identify international funding support. Develop training programs. Community consultations and signing of agreements.

Objective 6: Develop and Implement a Climate Resilience and Disaster Preparedness Plan for the Water Sector

Activity	Risk	Mitigation Measure
6.1: Map and model water resource vulnerabilities.	Inaccurate data collection could lead to ineffective modeling.	Utilize multiple data sources and cross-verification methods to ensure accuracy.
6.2 Develop disaster management plan and guidelines for water sector	Inadequately resourced	Work across sectors to leverage existing resources
6.3: Upgrade infrastructure with climate-resilient materials.	project cost and time overruns due to unforeseen issues with construction or material supply.	Implement rigorous project management protocols and establish contingency plans for budget and timeline overruns.

Activity	Risk	Mitigation Measure
6.4 Enhance capacity of key stakeholders in responding to climate change disasters that impact the water sector:	Low community engagement could result in inadequate preparedness. Lack of motivation or engagement in capacity enhancement programs from key stakeholders. Lack of baseline data to measure capacity improvements in climate resilience practices. Resistance to changing established water management practices (especially if the benefits of adaptation are not immediately clear).	Develop community engagement programs and incentives to encourage participation. Engage stakeholders early in the design of training programs to ensure the content is relevant and addresses their needs. Use a mix of incentives and mandatory policy directives to encourage participation. Before training, conduct a baseline assessment of current practices and vulnerabilities to climate change. Collaborate with stakeholder groups to co-create the adaptation toolkit, ensuring it is practical and user-friendly. Provide evidence of the effectiveness of adaptation strategies, including case studies and pilot projects, to demonstrate their value.

Objective 7: Strengthen Water Quality Management to Protect Public Health

Activity	Risk	Mitigation Measure
7.1: Ensuring proper monitoring, planning, and supply of drinking water.	Technological failures could lead to gaps in monitoring. Inadequate infrastructure or expertise to consistently monitor and manage water supply systems, leading to potential non-compliance.	Regular maintenance schedules and backup systems to ensure continuous operation. Invest in training for local water management authorities, adopt advanced water quality testing technologies, and establish partnerships with expert organizations to support ongoing water quality assurance programs.
7.2: Launch public awareness campaigns.	Public messaging may not effectively change behaviors.	Use a mix of media channels and feedback mechanisms to refine

Activity	Risk	Mitigation Measure
		messaging and engage community leaders to champion the cause.
7.3: Introduce incentives for sustainable practices in industry and agriculture.	Lack of uptake due to insufficient incentives or awareness.	Partner with industry associations when developing incentive systems. Continuously review and adjust the incentive structures to ensure competitiveness and relevance while maintaining regular dialogue with stakeholders.

2.4 Institutional Arrangements for Implementation

The water issues cut across virtually all sectors. As such, ensuring climate adaptation activities are properly implemented requires ensuring coordination mechanisms are in place that allow working with key stakeholders. The Department of Water (DoW) at the Ministry of Energy and Natural Resources (MoENR) is the national focal point for all water sector climate adaptation work in Bhutan. It leads in formulating policies, regulations and strategies related to water management. It has prepared the water section of the 13FYP and will be responsible for ensuring that proposed objectives and activities of the Water Sectoral Road Map are integrated with this plan.

DoW will work with other members of the newly formed Economic Cluster to ensure proposed activities are integrated with sectoral work plans. It will undertake this work in partnership with the Ministry of Finance which plays a key role in allocating and disbursing budgets to implementing agencies, as well as providing fiscal incentives to the private sector and members of the public. DOW will also develop annual performance agreements (APAs) with various government agencies, local governments and stakeholders.

Proposed institutional arrangements to support objectives and an activity are reflected in the tables that follow.

Objective 1: Strengthen Water Governance

Activity	Lead and Collaborating Agencies
1.1 Amend existing water policies, laws, and regulations to incorporate emerging climate issues and challenges in the water sector.	Department of Water (DoW) would lead this activity in collaboration with: ● Cabinet Secretariate ● Department of Local Governance and Disaster Management (DoLGDM) ● Department of Forests and Park Services (DoFPS) ● Department of Environment and Climate Change (DECC) ● National Center for Hydrology and Meteorology (NCHM) ● Ministry of Health ● Ministry of Agriculture and Livestock (MoAL) ● Department of Energy (DoE) Also consulted would be the following groups: ● CSOs: Bhutan Chamber of Commerce and Industry, Bhutan Water Partnership, Tarayana Foundation, Royal Society for Protection of Nature (RSPN), Mawongpa Water Solutions and SNV ● Universities: Royal University of Bhutan (RUB), College of Science and Technology (CST), College of Natural Resourecs (CNR) and Sherubtse College (Shercol)
1.2 Evaluate the progress of Bhutan's NIWRM Plan 2016 to identify gaps, and understand the impact of changing water demand and supply patterns	Department of Water (DoW) would lead this activity in collaboration with: ● Department of Environment and Climate Change (DECC), ● National Center for Hydrology and Meteorology (NCHM) ● Department of Energy (DoE) ● Department of Infrastructure Development (DoID) ● Department of Forests and Park Services (DoFPS) ● Department of Agriculture (DoA) ● Ministry of Health (MoH) ● Ministry of Infrastructure and Transportation (MoIT) ● Department of Local Governance and Disaster Management (DoLGDM) ● Water User Associations ● CSOs and other key stakeholders
1.3 Strengthening research on water resource management, including groundwater resources.	Department of Water (DoW) would lead this work in collaboration with: ● National Center for Hydrology and Meteorology (NCHM) ● CSOs including: - Tarayana Foundation - Royal Society for Protection of Nature (RSPN) - Bhutan Water Partnership - Mawongpa Water Solutions

	• Bhutan Chamber of Commerce and industry (BCCI) • Water User Associations (WUAs) • SNV • Royal University of Bhutan (RUB) and research institutions including: - College of Science and Technology (CST) - College of Natural Resources (CNR) - Sherubtse College (Shercol)

Amending existing water policies, laws, and regulations to incorporate emerging climate issues and challenges in the water sector will require a comprehensive review of legislation, plans and strategies. Table 2.0 provides a general summary that reflects the intra-sectoral linkages of water management. It will be important to work with national and local governments, as well as with Cabinet Secretariate when undertaking this work.

Updating and strengthening the NIWRM plan aligns with commitments made in Bhutan's 13 Five Year Plan as well as existing water policies (see Table 2 below). These policies and plans are designed to ensure the sustainable and equitable use of water resources, considering the socio-economic development and environmental sustainability of Bhutan, and address the challenges posed by climate change on water resources. In the 13FYP DoW's has committed to providing safe and affordable potable water for all as well as to developing Bhutan's national water resource master plan. The activities proposed under this objective 1 support the realization of these objectives.

Table 2.0 Policies, Strategies & Programs Aligned & Impacted by Proposed Water Climate Adaptation Objectives and Activities

General: ● 13 Five Year Plan ● Climate Change Policy of the Kingdom of Bhutan 2020 ● Bhutan's Nationally Determined Contributions (NDCs) 2021 **Environment:** ● National Environment Protection Act of Bhutan 2007, ● Environmental Assessment Act 2000, **Water:** ● Bhutan Water Policy 2025 ● Bhutan Water Vision 2025: ● The Water Act of Bhutan 2011 ● Water Policy 2007 ● Bhutan National Integrated Water Resources Management Plan 2016:	**Energy:** ● Alternative Renewable Energy Policy (2013), ● Energy Efficiency Roadmap (2019), ● Renewable Readiness Assessment ● Sustainable Hydropower Development Policy (2020), ● National Energy Efficiency Policy (2019), ● Power System Master Plan 2040, ● Renewable Energy Master plan (2017-2032), **Transport** ● Surface Transport Policy, **Health** **Agrifood** **Human Settlements**: ● Building code (currently being revised) ● Bhutan Green Building Guidelines

Objective 2: Strengthen Stakeholder Engagement

Activity	Lead & Collaborating Agencies
2.1 Establish local water councils to enable community engagement in water allocation decisions.	Department of Water (DoW) would lead this work in collaboration with: ● Department of Local Governance and Disaster Management (DoLGDM) ● Water User Associations ● Relevant CSOs
2.2 Train water managers, WUA chairman and policymakers in conflict resolution and adaptive management.	Department of Water (DoW) would lead this work in collaboration with: ● Department of Local Governance and Disaster Management (DoLGDM) ● Water User Associations ● Department of Infrastructure Development (DoID) ● Ministry of Agriculture and Livestock (MoAL) ● CSOs ● Universities
2.3 Create transparency mechanisms for water allocation decisions to ensure all stakeholders are informed.	Department of Water (DoW) and Department of Infrastructure Development (DoID) would lead this work in collaboration with: ● Department of Local Governance and Disaster Management (DoLGDM) ● Water User Associations ● Media
2.4 Regularly update and involve communities in the water allocation plans to reflect changing needs and priorities.	Department of Water (DoW) and Department of Infrastructure Development (DoID) would lead this work in collaboration with: ● Department of Local Governance and Disaster Management (DoLGDM) ● Water User Associations ● Department of Infrastructure Development (DoID) ● Ministry of Agriculture and Livestock (MoAL) ● CSOs ● Media

Strengthening stakeholder engagements is a critical component of effective water management across sectors. It is a governing principle of Bhutan's National Integrated Water Resources Management Plan 2016 and the founding principle of Water User Associations.

Objective 3: Invest in Water Allocation Monitoring and Enforcement Mechanisms

Activity	Lead & Collaborating Agencies
3.1: Develop and deploy a network of water usage sensors and gauges across critical points in water distribution networks.	Department of Water would lead this work in collaboration with: ● National Center for Hydrology and Meteorology (NCHM ● Department of Local Governance and Disaster Management (DoLGDM) ● Ministry of Agriculture and Livestock ● Department of Forests and Park Services (DoFPS) ● Department of Infrastructure Development (DoID) ● Universities
3.2: Set up a centralized database to monitor water allocations and usage in real time.	Department of Water (DoW) would lead this work in collaboration with: ● National Center for Hydrology and Meteorology (NCHM) ● Universities
3.3: Establish a task force to ensure compliance with water allocation policies, including the capacity to impose penalties on non-compliance.	Department of Water (DoW) would lead this work in collaboration with: ● Department of Infrastructure Development (DoID) ● Department of Agriculture (DoA) ● Department of Environment and Climate Change (DECC) ● Department of Forests and Park Services (DoFPS) ● Local Governments ● CSOs
3.4: Conduct annual reviews of water allocation efficiency and adjust policies based on data-driven insights.	Department of Water (DoW) would lead this work in collaboration with: ● Department of Local Governance and Disaster Management (DoLGDM) ● National Center for Hydrology and Meteorology (NCHM) ● Department of Infrastructure Development (DoID) ● Department of Forests and Park Services (DoFPS) ● Ministry of Health ● Ministry of Agriculture and Livestock (MoAL) ● Department of Energy (DoE) ● Department of Environment and Climate Change (DECC)

A robust water monitoring and enforcement system is required to support effective water governance of this resource. This will be achieved through investments in the sensor network deployment, establishing centralized water database systems, establishment of a task force and regular reviews of water allocation efficiency.

Monitoring and enforcement of water allocation, quality and conservation measures underpins Bhutan's Water Vision 2025 as well as Bhutan National Integrated Water Resources Management Plan 2016.

Objective 4: Enhance Water Use Efficiency Across All Sectors

Activity	Lead & Collaborating Agencies
4.1 Upgrade and maintain water infrastructure to reduce water loss.	The Department of Water and the Department of Infrastructure Development (DoID) would lead this activity in collaboration with: ● Department of Local Governance and Disaster Management (DoLGDM) ● Ministry of Health ● Ministry of Agriculture and Livestock ● Relevant CSOs
4.2: Improve irrigation management practices to reduce agricultural water consumption.	Department of Water and the Ministry of Agriculture and Livestock would lead this activity in collaboration with: ● Department of Infrastructure Development (DoID) ● Department of Local Governance and Disaster Management (DoLGDM) ● CSOs
4.3: Incentivize industries to reduce water use and increase recycling practices through tax breaks or subsidies.	Department of Infrastructure Development (DoID) would lead this activity in collaboration with: ● Ministry of Finance ● Ministry of Industry, Commerce and Employment (MoICE) ● Thromdes (municipalities) and Local Governments ● CSOs
4.4: Promote the use of water-efficient appliances and fixtures in domestic settings through awareness campaigns and rebate programs.	Department of Water (DoW) would lead this activity in collaboration with: ● Department of Infrastructure Development (DoID) ● Ministry of Industry, Commerce and Employment (MoICE) ● Department of Human Settlements ● Thromdes (municipalities) and Local Governments ● CSOs ● Media
4.5 Introduce stricter building codes that mandate water-saving technologies in new constructions and major renovations.	Department of Water (DoW) and Department of Infrastructure Development (DoID) would lead this activity in collaboration with: ● Department of Human Settlements (DHS) ● Ministry of Industry, Commerce and Employment (MoICE) ● Department of Local Governance and Disaster Management (DoLGDM) ● Bhutan Standard Bureau (BSB), ● Bhutan Construction and Transport Authority (BSTA)
4.6 Optimize water release schedules from hydroelectric dams to align with periods of peak power demand, minimizing unnecessary water spillage	Department of Water would lead this activity in collaboration with: ● Druk Green Power Corporation (DGPC) ● Department of Local Governance and Disaster Management (DoLGDM)

and improving the water-use footprint of power generation.	

Enhancing water use efficiency across sectors is crucial for sustainable water management in the face of climate change impacts in Bhutan. Not only is this called for in Bhutan's NAP, 13 FYP and Bhutan National Integrated Water Resources Management Plan 2016, efficient and sustainable use of water is called for in the following policies and plans:

- Energy Efficiency Roadmap (2019),
- Sustainable Hydropower Development Policy (2020),
- National Energy Efficiency Policy (2019),
- Renewable Energy Master plan (2017-2032)

Objective 5: Ensure the Environmental Sustainability of Water Sources

Activity	Lead & Collaborating Agencies
5.1: Implement ecosystem-based management practices that support the sustainability of water resources	Department of Water (DoW) would lead this work in collaboration with: ● Department of Forests and Park Services (DoFPS) ● Department of Environment and Climate Change (DECC) ● Department of Local Governance and Disaster Management (DoLGDM) ● CSOs
5.2: Mandate environmental flow requirements in water allocation to preserve aquatic ecosystems.	Department of Water (DoW) would lead this work in collaboration with: ● Department of Forests and Park Services (DoFPS)
5.3: Conduct regular environmental impact assessments to monitor the health of water sources.	DoECC would lead this work in collaboration with: ● Department of Water ● Department of Forests and Park Services (DoFPS) ● Department of Environment and Climate Change (DECC) ● Department of Infrastructure Development (DoID) ● Department of Local Governance and Disaster Management (DoLGDM) ● CSOs
5.4: Rehabilitate and protect critical watersheds and aquifers to ensure long-term water availability.	Department of Water (DoW) would lead this work in collaboration with: ● Department of Forests and Park Services (DoFPS) ● Ministry of Agriculture and Livestock

Ensuring the sustainability of water resources is the primary goal of Bhutan National Integrated Water Resources Management Plan 2016 and is further supported by the following policies, regulations and plans shown in the table below:

General: ● 13 Five Year Plan ● Climate Change Policy of the Kingdom of Bhutan 2020 ● Bhutan's Nationally Determined Contributions (NDCs) **Environment:** ● National Environment Protection Act of Bhutan 2007, ● Environmental Assessment Act 2000,	**Water:** ● Bhutan Water Policy 2025 ● Bhutan Water Vision 2025: ● The Water Act of Bhutan 2011 ● Water Policy 2007

Objective 6: Develop and Implement a Disaster Preparedness Plan for the Water Sector

Activity	Lead & Collaborating Agencies
6.1: Map and model water resource vulnerabilities to anticipate and mitigate the impacts of climate-induced disasters such as floods and droughts.	Department of Water (DoW) and the Department of Local Governance and Disaster Management (DoLGDM) would lead this work in collaboration with: ● National Center for Hydrology and Meteorology (NCHM) ● Department of Environment and Climate Change (DECC) ● Ministry of Health ● Ministry of Agriculture and Livestock ● Department of Infrastructure Development (DoID) ● Department of Forests and Park Services (DoFPS) ● CSOs ● Universities
6.2 Develop disaster management plan and guidelines for water sector	Department of Water (DoW) and the Department of Local Governance and Disaster Management (DoLGDM) would lead this work in collaboration with: ● Ministry of Industry, Commerce and Employment (MoICE) ● Ministry of Agriculture and Livestock ● Ministry of Health ● Department of Local Governance and Disaster Management (DoLGDM) ● CSOs
6.3: Upgrade infrastructure with climate-resilient materials and design flood barriers and water storage facilities to withstand extreme weather events.	Department of Water (DoW) and Department of Infrastructure Development (DoID) would lead this work in collaboration with: ● DoECC ● Ministry of Agriculture and Livestock ● Department of Local Governance and Disaster Management (DoLGDM) ● Key private sector contractors

6.4 Enhance capacity of key stakeholders in managing the impacts of climate change on water	Department of Water (DoW) and Department of Environment and Climate Change (DECC) would lead this work in collaboration with: ● Ministry of Agriculture and Livestock ● Ministry of Health ● Ministry of Infrastructure and Transportation (MoIT), ● Department of Forests and Park Services (DoFPS) ● Department of Local Governance and Disaster Management (DoLGDM) ● CSOs ● Industry Associations ● Media

Climate change has increased the vulnerability of the water sector to a range of hazards including the drying of water sources to localized flash floods, fire hazards and other natural disasters. As a result, developing and implementing disaster preparedness plans for the water sector is critical for ensuring the sustainability and reliability of water sources.

Developing disaster response plans and mitigating the impacts of climate change are key activities aligned with Bhutan's 13 Five Year Plan, the Climate Change Policy of the Kingdom of Bhutan 2020, Bhutan's Nationally Determined Contributions (NDCs) and the National Adaptation Plan (NAP). These objectives are also reinforced with the following policies and plans.

Environment:	**Water:**
● National Environment Protection Act of Bhutan 2007, ● Environmental Assessment Act 2000,	● Bhutan Water Policy 2025 ● Bhutan Water Vision 2025: ● The Water Act of Bhutan 2011 ● Water Policy 2007 ● Bhutan National Integrated Water Resources Management Plan 2016:

Objective 7: Strengthen Water Quality Management to Protect Public Health

Activity	**Lead & Collaborating Agencies**
7.1: Ensuring proper monitoring, planning, and supply of drinking water.	Department of Water and the Ministry of Health would lead this work in collaboration with: ● Department of Infrastructure Development (DoID) ● Department of Local Governance and Disaster Management (DoLGDM) ● Thromdes and Local Government ● CSOs ● Universities
7.2: Launch public awareness campaigns on the importance of water conservation and the impact of pollution on health,	The Department of Water (DoW) would lead this work in collaboration with: ● Ministry of Health (MoH)

targeting both urban and rural populations.	● Department of Local Governance and Disaster Management (DoLGDM) ● Media ● CSOs
7.3: Introduce incentives for industries and agriculture to adopt cleaner processes and environmentally friendly practices that reduce water contamination.	The Department of Water would lead this work in collaboration with: ● Ministry of Finance ● Ministry of Agriculture and Livestock ● Department of Local Governance and Disaster Management (DoLGDM) ● Thromdes and Local Government ● Media ● CSOs

Managing potable water services, while safeguarding water quality and health are key elements of any water strategy. Climate change will further challenge attaining these goals as water sources become scarcer, while flash floods and landslides put further pressure on water basins.

Undertaking these activities are aligned with Bhutan's 13 Five Year Plan, the Climate Change Policy of the Kingdom of Bhutan 2020, Bhutan's Nationally Determined Contributions (NDCs) and the National Adaptation Plan (NAP). These objectives are also aligned with the following policies and plans.

Environment:	**Water:**
● National Environment Protection Act of Bhutan 2007, ● Environmental Assessment Act 2000,	● Bhutan Water Policy 2025 ● Bhutan Water Vision 2025: ● The Water Act of Bhutan 2011 ● Water Policy 2007 ● Bhutan National Integrated Water Resources Management Plan 2016:

3 Awareness & Sensitization Plan

To ensure the successful implementation of the Water Sector Roadmap, an awareness and sensitization plan is required to ensure key stakeholders are:

- Are aware of the Roadmap, its goals and objectives
- understand how the implementation of the Roadmap impacts their organization and their work
- know what resources are available to support implementation.

3.1 Stakeholder Identification & Information Needs

The Water Sector comprises a wide range of stakeholders that all have a stake in climate adaptation. Each group will have a different set of information needs regarding the current NAP and its implementation. Table 4.1 on the following page provides an overview of the major stakeholder groups and their information needs. In general, these can be summarized as follows:

- **Government agencies**: Will need to lead and coordinate the implementation of their relevant NAP activities. They will also be responsible for identifying how existing policies, programs and activities will be used to support proposed NAP goals and activities as well as report on progress.
- **Industry associations**: These are potentially key partners for implementing the Water Sector Roadmap. Their roles can include outreach to members, capacity building, co-hosting workshops and conferences and other awareness raising activities. This work will likely have to receive financial support and be formally incorporated with climate funding activities.
- **Major businesses**: There are likely a few key businesses, including SOEs, that operate in Bhutan that are key players in the Water Sector. A list of these will need to be developed, however their engagement is likely crucial for achieving adaptation goals.
- **Stakeholder groups:** Beyond industry associations, farmers cooperatives and other stakeholder groups will be important to engage in awareness raising activities, especially as they relate to local adaptation initiatives.
- **Not for Profits**: NGOs will likely play a key role in implementing adaptation activities at the local level. Not only should they be targeted for awareness raising around Water Secor Roadmap objectives. Local NGOs in particular should also benefit from training that builds specific skills to support project implementation.
- **University and Research Centers:** these institutions can play a pivotal role in (i) conducting related climate adaptation research (ii) providing professional training and (iii) ensuring students are equipped with the knowledge and skills required to support adaptation efforts post-graduation.
- **Donors and Development Partners**: It's important for international organizations to be engaged throughout implementation of the sectoral NAP so they understand what progress has been made, lessons learned, and what potential gaps need to be met from a funding perspective.

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
1. Government Agencies:				
Ministry of Energy and Natural Resources (MoENR):	Department of Water is the lead agency for Bhutan's water sector. It also is a member of the NAP Readiness Project Board and serves on the technical working group of NAP	Understand Water Sector Roadmap for implementing Bhutan's NAP and how it relates to staff responsibilities. Understand intersectoral linkages and how to work with other ministries and stakeholders for how to coordinate activities.	DoW's mandate is to ensure safe and clean water for all in the face of changing climate. It is the focal agency overseeing the water sector NAP implementation and progress tracking. As such it would lead on awareness raising goals	To be developed
	Department of Environment and Climate Change is the lead agency for overseeing Bhutan's NAP and other climate change plans and programs. It also serves as the Secretariat of the National Environment Commission. As such it will play a key role in ensuring central and sectoral government agencies coordinate their efforts to achieve Water Sector goals.	Understand Water Sector Roadmap for implementing Bhutan's NAP and how it relates to staff responsibilities. Understand intersectoral linkages and how to work with other ministries and stakeholders for how to coordinate activities.	DECC is responsible for coordinating and collaborating with other ministries and relevant stakeholders to support NAP implementation. It also aligns department plans and programmes with NAP goal/objectives and takes the lead in	To be developed

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand what resources are available to support its work.	related capacity building initiatives.	
	Department of Energy is the lead agency for energy sector NAP work. With regard to the Water NAP it plays a key role in hydroelectric power generation and is therefore a key stakeholder as a water sector user.	Understand how objectives and activities proposed in the Water Sector Roadmap impact hydroelectric generation. Understand what opportunities there are for working with other sectors to co-manage water resources. Understand what resources are available to support its work.	Ensuring appropriate allocation of water resources among sectors will have implications for how DoE manages hydroelectric power generation.	To be developed
	Department of Forests and Park Services is the focal agency for forests and biodiversity in Bhutan's NAP. It therefore plays a key role in managing watershed and river basin areas critical for realizing the goals and objectives of the Water Sector Roadmap	Understand how objectives and activities proposed in the Water Sector Roadmap impact forests and biodiversity. Understand what opportunities there are for working with other sectors to co-manage water resources.	DFPS role is to conserve and manage Bhutan's forest biological resources to ensure socio- economic and environmental well being. This includes (i) ensuring that natural ecosystems have access to sufficient water to ensure their	To be developed

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand what resources are available to support its work.	sustainability, and (ii) helping manage river basins to ensure adequate supply and quality of water for other sectors.	
Ministry of Industry, Commerce and Employment	Department of Industry is responsible for promoting the sustainable growth and development of Bhutan's industries. Water is a key input for many industries. Wastewater contributes to degrading water supplies in addition to having an adverse impact on human health and natural ecosystems. Realizing the objectives of the Water Sector Road map will be key to ensuring Bhutan's industries are sustainable. DoI is responsible for budget allocation for NAP activities and is a member of the NAP technical working group	Understand how objectives and activities proposed in the Water Sector Roadmap impact industry and how DOI promotes industrial development in Bhutan. Understand what opportunities there are for working with other sectors to co-manage water resources. Understand what resources are available to support its work.	Promoting green economy Sustainable growth and development of industries	To be developed
Ministry of Health	Ensuring access to clean, potable water for Bhutan's population is a key health goal. It is also critical for the functioning of any health facility. MoH is a member of NAP technical working group.	Understand how objectives and activities proposed in the Water Sector Roadmap impact the Health Sector in Bhutan.	MoH works to strengthen monitoring of water quality, sanitation and hygiene. It also works with other agencies to implement strategies	To be developed

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand what opportunities there are for working with other sectors to co-manage water resources to optimize health outcomes. Understand what resources are available to support its work.	for vector control and prevention programs Implement the findings from climate risk assessment on health	
Ministry of Infrastructure and Transport	MoIT Infrastructure and Transport plays a key role in the construction and maintenance of water infrastructure in Bhutan. It is therefore a key player implementing the Water Sector Roadmap. Department of Infrastructure Development (DoID) was involved in consultations leading to the formulation of Bhutan's NAP.	Understand how objectives and activities proposed in the Water Sector Roadmap impact the development and maintenance of water infrastructure. Understand what opportunities there are for working with other sectors to co-manage water resources to optimize water services. Understand what resources are available to support its work.	Provision of safe drinking water & clean sanitation to citizens. Promote research & development that would serve to maintain a synergy between technology, environment & traditional values.	To be developed

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
Ministry of Home Affairs (MoHA)	MoHA oversees matters related to local governance and disaster risk reduction Department of Local Governance and Disaster Management (DoLGDM) at MoHA is the national lead for: ● Mainstreaming disaster risk reduction into development plans, policies, programmes and projects; ● Develop, maintain and update Disaster Management Information System in coordination with relevant agencies. It is therefore a key player for reducing risk through implementation of the Water NAP	Understand relevance of disaster management objectives in the Water Sector Roadmap to its own work. Understand opportunities for working with other sectors to reduce risk to water resources Understand what resources are available to support its work	Mainstream disaster risk reduction into development plans, policies, programmes and projects; Develop, maintain and update Disaster Management Information System in coordination with relevant agencies. To strengthen disaster management capabilities for prevention and response to disasters.	To be developed
Ministry of Agriculture and Livestock	MoAL is responsible for water use and allocation in the agrifood sector. It also has a stake in maintaining water quality to ensure that Bhutanese people have access to healthy food.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work.	MoAL works to ensure that crops and livestock have access to adequate water resources. It also is a key player in the environmental	To be developed

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
	It has worked as a member of the technical working group and drafting committee for Bhutan's NAP.	Understand opportunities for working with other sectors to reduce risk to water resources. Understand what resources are available to support its work	management of watershed with the potential to reduce effluent/pollution from agricultural activities to local water bodies.	
Ministry of Finance (Department of Macro-Fiscal and Development Finance)	MoF plays a key role in ensuring adequate financing is available to implement objectives and activities in the Water NAP.	Understand cross sectoral importance of Water Sector objectives and activities. Understand how to balance competing financial needs of other sectors with water sector needs. Understand what resources are available to support its work.	MoF is responsible for climate financing as well as macroeconomic policy formulation and coordination. It plays a leading role developing relations with bilateral and multilateral financial institutions. It is also Bhutan's National Designated Authority for the Green Climate Fund (GCF).	To be developed
National Center for Hydrology and Meteorology	NCHM plays a leading role in identify long term climate change trends and risks to the water sector. It is a member of the NAP technical working group.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work.	NCHM is responsible for climate services and long-term monitoring of climate change impacts to water resources. This	To be developed

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand its role in facilitating cross sectoral collaboration through sharing of relevant data. Understand what resources are available to support its work.	includes making this information available in form and format accessible to all people, including those with disabilities. It leads the assessment and mapping of hydrometeorological and GLOF hazards at the sub-basin and basin level and updates Bhutan's climate projections. Promote collaboration and institutional linkage with national, regional, international organizations related to climate, weather, hydrology, cryosphere, and water resources.	

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
Local Government (Including municipalities)	Local governments provide inputs through regional consultation for NAP formulation. They are a key player for implementing local activities proposed for the Water Sector.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for working with other sectors to reduce risk to water resources. Understand what resources are available to support community level work.	Local Governments play a key role in implementing water sector activities identified in the NAP and 13 FYP. This includes managing water distribution, conflict management at the local level, planning and budgeting.	To be developed
2. Industry Associations:				
Bhutan Chamber of Commerce & Industry (BCCI):	BCCI was involved in national consultation during the drafting of the overall NAP document and is a considered a key implementation partner.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for working with its members to realize Water Sector objectives and partner on implementation of proposed activities.	BCCI plays a key role in promoting private sector development in Bhutan. Through its membership it can play a key role in raising awareness of Water Sector NAP goals, as well as working with members to forge critical partnerships to implement key activities identified for the water sector.	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand what resources are available to support this work.		
3. Major Businesses:				
Druk Green Power Corporation (DGPC):	DGPC is a Bhutanese hydropower generation company, playing a vital role in the country's renewable energy landscape. As a power utility it therefore is a key player in managing water resources and their vulnerabilities driving by climate change.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities how to internalize Water Sector objectives and partner with other stakeholders to implement proposed activities. Understand what resources are available to support this work.	DBPC will need to manage water flows to both ensure adequate power supplies while providing other water sectors with access to sufficient flows and quantities of water.	Unknown
4. Not-for-profits/NGOs:				
Bhutan Trust Fund for Environmental Conservation (BTFEC):	An independent organization, BTFEC supports many environmental projects.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for	BTFEC implements activities in 5 thematic areas (Preserving biological diversity, mitigating and adapting to climate change, enabling human	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	wildlife coexistence, addressing adverse development impacts to the environment)	
WWF Bhutan: World Wildlife Fund (WWF)	WWF has a presence in Bhutan and, while primarily an environmental conservation organization, they engage in projects involving preserving habitats and reducing human-wildlife conflict.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	WWF works on various environmental conservation programs including protection of terrestrial and freshwater ecosystems, and climate change.	Unknown
Bhutan Ecological Society:	This organization promotes research, knowledge-sharing, and best practices in ecological conservation.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work.	BES carry out numerous activities on biodiversity conservation, advocacy and policy influence, and	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	climate change adaptations	
Tarayana Foundation:	Member of NAP technical working group. They support implementation of climate adaptation activities at the local level.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	Focuses on working in remote, rural villages to bring about holistic community growth and development by serving vulnerable and disadvantaged communities.	Unknown
Royal Society for Protection of Nature (RSPN)	RSPN as TWG of NAP Involved in the conservation of the Kingdom's environment.	Educate community on climate adaptation initiatives.	Community engagement in sustainable livelihoods	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		advocacy on how RSPN development programmes can align contribute to climate change adaptation	Conservation of environment	
Bhutan Toilet Organization	Non-governmental organization dedicated hygiene and sanitation initiatives in Bhutan	improved sustainable management of water resources in hygiene and sanitation.	Community health improved sanitation infrastructure Sustainable solutions	Unknown
Loden Foundation	CSO working towards supporting entrepreneurship development, social impacts and environmental projects	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	Supporting projects related to environmental conservation and sustainable practices. Encouraging environmentally friendly entrepreneurship and awareness.	Unknown
5. Universities/Research Institutions:				
Khesar Gyalpo University of Medical Sciences of Bhutan	Khesar Gyalpo University works as a member of the NAP technical working group. It plays a role in monitoring water quality and setting permissible standards	Understand how objectives and activities of Water Sector Roadmap are relevant to its work.	Develop state of art, learner-centered, integrated and humanistic training curricula that meets the health needs.	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	Contribute towards evidence-based health policies and practices through research and innovation.	
College of Natural Resources	Technical working group and board member of NAP from RUB College of Natural Resources is actively involved as the facilitators of capacity building of Climate Action training for mid level civil servants, LG leaders, financial institutions and media personnel.	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	Provide higher education in Agriculture, Natural Resources Management and Rural Development. Transfer knowledge through research in Agriculture, Natural Resources Management and Rural Development	Unknown
College of Science and Technology	Involved as a member of the NAP technical working group.	Understand how objectives and activities of Water Sector	Only institute offering the tertiary level water resource curriculum course	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
	Offers B.E. in Water Resource Engineering	Roadmap are relevant to its work. Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.		
6. Stakeholder Groups:				
Association of Bhutanese Industries	Consulted during the NAP formulation. Member of technical working group for NAP	Understand how objectives and activities of Water Sector Roadmap are relevant to its work. Understand opportunities for supporting the implementation of Water Sector objectives and activities. Understand what resources are available to support this work.	Could play a key role in raising awareness of Water Sector goals and objectives with members. Could be a key partner in helping members actively engage in implementation of water sector NAP activities.	Unknown

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
7. International Agencies:				
Asian Development Bank	Supported various projects including hydropower development, climate smart transport systems and climate adaptation and environment conservation. Is supporting development of Water Sector Roadmap	Understand how proposed water sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	ADB provides policy-based loans and technical assistance that can potentially be used to support the implementation of Water Sector objectives and activities.	N.A.
United Nations Development Programme (UNDP)	Project Management Unit for NAP Coordinate with National lead partner and other stakeholders in formulation of NAP documents and NAP readiness project. Facilitate and mobilize resources for climate adaptation projects.	Understand how proposed water sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Supporting three directions of change, structural transformation, leaving no one behind and building resilience. Through six signature solutions, poverty and inequality, governance, resilience, energy environment and gender equality. Enhanced by three enablers, strategic innovation, digitalization, and development financing.	N.A.

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
World Health Organization (WHO):	Has been supporting public health initiatives in Bhutan. These have a direct link to health outcomes articulated in the Water Sector NAP.	Understand how proposed water sector activities align with its funding priorities. Understand alignment of proposed water NAP work with 13 FYP and existing health policies.	Prescription of water quality standards	N.A.
World Bank (WB)	WB has supported numerous projects on health, energy, water, education and rural development sectors	Understand how proposed water sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Promote renewable and sustainable forms of energy, water conservation and management, etc.	N.A.
SNV Netherlands Development Organization:	This international development organization has worked in Bhutan on renewable energy projects, particularly on clean cooking and heating solutions.	Understand how proposed water sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Promote sustainable and renewable energy projects, invests in water and sanitation and other clean forms of energy for cooking	N.A.
USAID	USAID focuses primarily on energy projects regionally as well as in Bhutan. It also supports disaster risk reduction work	Understand how proposed water sector activities align with its energy funding priorities.	Promotes regional energy security	N.A.

Stakeholder Groups	Water NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
		Understand alignment of proposed NAP work with 13 FYP and existing policies.		

3.2 Outreach Activities

3.2.1 Raising Awareness

It will be important for all relevant ministries and their staff to be aware of the Water Sector Roadmap's goals and objectives. To this end the following activities should be undertaken:

- Organize Official Launch Events: Ministries can plan to host an inaugural event for the Water NAP and Roadmap, inviting all relevant national government officials, donors, key staff and stakeholders. It will be particularly important to ensure joint ministerial events are developed so that ministries understand the importance of partnerships and coordination required to achieve NAP objectives.

- Distribute Relevant Documentation: Ensure that copies of the Water Sector Roadmap – and any other relevant documents - are distributed to key staff.

- Briefings: Ensure that department heads brief their staff on the relevance of the NAP to their work, workplan and progress.

- Newsletters and email bulletins: Periodic updates should be provided to staff on progress being made towards achieving deliverables through internal newsletters or email bulletins.

3.2.2 Internalize NAP Goals & Objectives

It will be important for Ministries and other stakeholders to understand how the NAP commitments will impact their work, resources and performance. A series of workshops should be held that bring key senior staff together to discuss how Water NAP activities will be:

- integrated with existing policies, strategies, programs.
- coordinated with other ministries and stakeholders.
- supported by existing tools, budgets and resources.
- monitored and reported upon using agreed upon KPIs and databases.
- supported by staff training and HR strategies.

Findings from these workshops will be used to strengthen the NAP road map and support implementation.

3.2.3 Supporting the Water Sector Roadmap Rollout

It will also be important for ministry staff and key stakeholders to be aware of available resources to support NAP implementation. The following resources and activities should be developed to support outreach activities:

- Bhutan Climate Platform: The BCP has been developed to support climate change initiatives in Bhutan. This portal could be updated to support tracking of NAP related activities across sectors. This work might be undertaken by the Capacity Building Initiative for Transparency Initiative (CBIT) project with DECC.

- Tracking system: the Water NAP (and other NAP sectors) would benefit from having a database system developed that tracked progress of activities against stated outcomes in the NAP sector road map. This will be particularly important since the success of stated goals and objectives will depend upon inter-ministerial and multi-stakeholder coordination.

- Resource guidelines, training modules and toolkits should be developed/compiled and distributed to support NAP implementation. Outreach activities will need to be conducted to ensure staff and stakeholders are aware of these resources and understand how to access them.

- Financing Workshops: Organize sessions in collaboration with the Ministry of Finance and potential donors to inform officials about budget allocations, external funding sources, and financial management related to NAP implementation.

4. Conclusions & Next Steps

The current version of this Road Map requires further work for completion. Specifically, consultations and inputs are required from the following groups:

- Senior management from each lead government agency.
- Staff from departments within lead ministries responsible for implementation climate adaptation activities that were not included in Phase 1
- Cross cutting government agencies (note that this was originally envisioned to take place during the workshop, however due to limited funding was not possible)
- major stakeholder groups
- donors

The objective of these consultations would be to reach consensus and sign-off from senior management, and to ensure gender considerations are mainstreamed (where appropriate) with proposed activities.

To support this work the following activities are proposed:

a) Resolving Phase 1 issues: This will be done with NAP focal points to resolve outstanding issues flagged in this report.

b) Training: As per Phase 1, training would be undertaken to support further inputs from stakeholders. Preposed topics to be covered could include:

   - logframework development for staff who still require training
   - climate adaptation training targeting sectoral needs
   - gender mainstreaming approaches.

c) Working Sessions: A second round of off-site working sessions would be conducted with select sectoral stakeholders to:

   - review goals, objectives and activities in sectoral road maps,
   - identify gender needs for proposed objectives and activities,
   - review institutional implementation arrangements and
   - finalize proposed awareness and sensitization strategies

d) Donor Resource Mobilization Workshops: Results of working sessions would then be presented to a group of donors at a separate workshop for their inputs and comment. Since many donors work across all 3 sectors a single workshop could likely serve this purpose.

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Attachment 1: NAP Monitoring & Evaluation Guidelines

NAP monitoring and evaluation (M&E) strategies allow countries to track their progress, understand the effectiveness of interventions, and take remedial action where required (Bamberger, M. et al 2016). They also help ensure transparency and accountability to donors and stakeholders (OECD, 2019).

Since the proposed objectives, activities and tasks outlined in the previous section are likely to be financed and implemented as separate projects, a detailed M&E strategy for the Renewable Energy NAP Sector is not presented here. Instead, an overview of best practice is provided to help guide future work (Kusek, J. Z., & Rist, R. C., 2004).

The subsections that follow provide a comprehensive overview of what components M&E strategies should address. Smaller projects may apply a subset of these variables to track.

Provide A Clear Statement of Objectives:

A monitoring and evaluation strategy needs to be developed with a clear understanding of the goals and objectives of a project (Rossi, P. H. et al 2004).[2] It also should reflect a clear understanding of the desired outcomes expected as a result of a project's activity (Weis C.H. 1998).

Logframeworks are ideal tools for this purpose (Gasper D, 2000). They are used to present a logical coherent framework of objectives, activities and tasks that "add-up" to a stated goal.[3] They can also be used to identify KPIs and Risks that need to be monitored and managed respectively (Dale R. 2003). Section 2.1 of this report provides the starting point for developing an M&E strategy for this NAP sector.

Develop SMART Indicators (KPIs) To Assess Progress and Impacts

When developing and implementing a project there are three types of indicators that can be developed and used to measure the effectiveness of project:

- Output Indicators: Measure the direct results of activities (e.g., number of workshops held, number of solar panels installed, etc.). These are the easiest to measure, and often provide an indication of progress being made against project schedules.

- Outcome Indicators: Measure the change that has come about because of the outputs (e.g., increased number of houses with access to power, reduced number of communities vulnerable to flooding). These often take longer to establish and measure than output indicators. As a result, it is important to allocate sufficient time, resources and budget as a project begins to wrap up for these indicators to be measured.

[2] Source : https://thecompassforsbc.org/how-to-guide/how-develop-monitoring-and-evaluation-plan

[3] Source : https://assets.publishing.service.gov.uk/media/5a7eb90aed915d74e622610c/Back-to-Basics.pdf

- Impact Indicators: These indicators are used to measure the broader, long-term changes produced by the NAP (e.g., increased agricultural productivity in a region). Often, they fall outside of a project's timeline and budget. However, countries often track these indicators as part of measuring their economic/social performance.

All indicators used should be SMART – meaning:

- Specific to the desired outcome,
- Measurable to allow for clear tracking,
- Achievable in the context of the resources and time available,
- Relevant to the NAP's objectives, and
- Time-bound to ensure they provide timely feedback.

Develop Feedback Mechanisms for Project Management:

In addition to project impact data, project managers will need to have access to additional information to ensure the project is running smoothly. Examples of this data include:

- **Financial Data**: Information on budget allocations, expenditures, financial forecasts, and any financial anomalies. Reporting this data supports financial accountability, transparency, and optimization of resource allocation.

- **Operational Data**: Data on day-to-day operations, staff performance, logistical issues, etc can be used to optimize operational efficiency of the project team and address logistical challenges.

- **Stakeholder Feedback Data**: Qualitative and quantitative feedback from stakeholders (like local communities, partner organizations, etc.) will help flag concerns and perceptions on project effectiveness.

- **Risk and Issue Logs**: Data on identified risks, their potential impact, and mitigation strategies, along with a log of issues that arise during implementation are critical. Collecting this data assists project managers proactively resolution of emerging challenges. Section 2.3 provides an overview of risks to be managed with proposed mitigation measures.

- **Capacity and Training Metrics:** Data on capacity-building activities, attendance and training outcomes can be used to evaluate effectiveness of training initiatives and identify where further efforts are required.

- **Environmental Data:** monitoring environmental impacts associated with project activities (involving for instance construction) can help ensure alignment with NAP goals.

- **Lessons Learned and Best Practices**: Documented experiences, both positive and negative, from the project is an important requirement of many donors. It also facilitates continuous learning, can be used to inform future NAP strategies.

Collecting the above data on a regular basis helps ensure that project managers have a holistic understanding of project performance. This enables them to make informed decisions, address issues, and adapt to evolving circumstances effectively. Proper data collection also requires the use of suitable tools, methodologies, and trained personnel to ensure accuracy and relevance. For larger projects a range of project management software is available to collect, analyze and report on data.

Establish Roles and Responsibilities:

The M&E strategy needs to clearly define who will be responsible for various M&E tasks. This involved determining which ministries and partners are responsible for implementing specific M&E activities. Ideally these are the same organizations involved in implementing NAP activities and tasks.

Section 2.5 of this report provides an overview of institutional arrangements for implementing the Water NAP program. These same groups will be involved in monitoring and evaluating the activities they are responsible for. However, a lead focal point/ministry will need to be designated as being responsible for amalgamating and reporting on data collected.

The M&E strategy also needs to identify:

- Data Collection Tools & Decision Support Systems to Be Used: Determine which tools and decision support systems will be most effective for collecting, managing and reporting on data collected. Depending on the project this can involve collecting both qualitative and quantitative data using surveys, remote sensing, community feedback, etc. Where possible decision support systems used should link with other national M&E systems to create synergies, avoid duplication, and promote efficiency.

- Personnel and Training Needs: It will be important to ensure that staff involved in monitoring and evaluation activities have the appropriate knowledge and skills. This can involve training, workshops, and sharing of best practices.

Develop a Budget

How one develops and presents a budget for a monitoring and evaluation strategy will depend very much on (i) the size and complexity of the project (ii) sources of funding and any donor requirements.

There are a few important points to keep in mind when developing an M&E budget:

- **Involve Stakeholders**: Engage with key stakeholders early in the process. This includes national and local government agencies, NGOs, community representatives, and international donors. Their input can provide insights into potential costs, available resources, and priorities for M&E activities.

- **Clearly Define M&E Activities**: List all planned M&E activities, such as data collection, analysis, reporting, workshops, stakeholder consultations, and capacity-building sessions. This will facilitate a more accurate estimation of costs.

- **Consider the Entire Project Lifecycle:** M&E activities should include baseline studies, ongoing monitoring, mid-term evaluations, end-term evaluations, and post-implementation reviews. The latter are critical for capturing longer term impacts.

- **Prioritize M&E Activities Based on Importance and Feasibility**: Given limited resources, it's essential to prioritize M&E activities based on their relevance to project objectives, feasibility of implementation and value for informing decision making. This can include periodically assessing the cost-effectiveness of M&E activities to decide whether or not to continue investing in these activities or cut back.

- **Use a Mix of Data Collection Methods**: Utilize a mix of qualitative and quantitative methods to collect required data and information. When doing so, consider the cost implications of each method. There will be trade-offs with each one. For instance, surveys might provide comprehensive data, but they can also be more expensive than focus group discussions or key informant interviews.

- **Invest in Technology and Tools**: Collecting, storing and analyzing data will require an investment in appropriate tools. This can include software for data analysis, mobile devices for field surveys, etc. Investments in technologies should be made when a long-term case can be made for their use. If a ministry has existing M&E systems or frameworks, align the NAP M&E budget with them to optimize resources and avoid duplication.

- **Ensure Funds are Budgeted for Capacity Building**: Training staff in M&E techniques and tools is essential for collecting accurate and consistent data. Budget for workshops, training sessions, and materials to build internal M&E capacity.

- **Contingency Allowance**: Always have a contingency allowance in your budget to address unforeseen challenges that arise during M&E implementation. Many donors will allow between 5-12% of a project budget to be held in reserve for this purpose. Often use of these funds requires permission from the donor.

- **Regularly Review and Adjust the Budget**: M&E budget needs may change over time for larger projects. Regularly review the budget against M&E needs and re-allocate where appropriate.

By adopting these best practices, ministries can develop M&E budgets for their NAPs that are comprehensive, realistic, and aligned with their adaptation priorities. Proper budgeting is a foundational step to ensure that M&E systems effectively inform decision-making throughout the NAP process.

Develop a Schedule for Monitoring & Evaluation Activities:

It is important to establish a timeline for monitoring and evaluation activities that supports project implementation. Key milestones include:

Establish Baseline Data: Its critical to ensure that baseline data be collected before the project starts to implement its activities. This data provides a reference point against which to measure positive impacts that can be attributed to the project's interventions.

Regular Monitoring: Regular monitoring activities are required to report on project activities. In addition, key milestones in project delivery also need to be supported by monitoring of related data. This information needs to be collected, analyzed and reported on at regular intervals to allow project managers to make adjustments if certain strategies aren't working.

Evaluation: At specific milestones, projects are required to conduct a more comprehensive analysis of the progress and impact. Typically, this is done through:

- A Mid-Term Evaluation: Evaluates the progress halfway through a project's implementation. Mid-term evaluations can be done internally or outsourced to a third party for a more objective assessment of impact and progress. In some cases, both options are exercised to provide a basis for comparison.

- And End-of-Project Evaluation: Assesses the overall impact and effectiveness of the NAP upon its completion. Similarly internal reports and external evaluations by third parties can be conducted for large initiatives.

Stakeholder Engagement: Outside of the immediate project activities it is important to engage relevant stakeholders in the M&E process. This can include soliciting inputs from and reporting to government agencies, local communities, NGOs, and others.

Donor Reporting: Many donors require projects to provide project updates on a regular basis. Including donors in the stakeholder engagement process can also promote transparency and can aid in securing funding for future initiatives.