Energy 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 *Energy Sector Roadmap* has been developed to support the funding and implementation of sectoral National Adaptation Plan (NAP) priorities in Bhutan. The country's first NAP was submitted on 22 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 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 energy sector adaptation priorities for climate financing (log frame)
- A resource mobilization strategy (guidelines and donor scan)
- Draft plan to raise the awareness of energy sector stakeholders regarding NAP goals and how they impact their work.

To support the 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 this process in the conclusion section of this report.

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

2 Energy Sectoral Roadmap for Implementing Bhutan's NAP.

2.1 Gap Analysis

Bhutan submitted its first NAP on September 22, 2023 to UNFCCC. To support implementation, a review was undertaken of proposed strategic objectives, outcomes, actions, and activities with a focus on three sectors: agrifood, water and energy. This entailed:

- Revisiting stated adaptation 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 several opportunities were identified for strengthening future NAPs exercises. They include:

1. Employing a simplified version of logframes (as used in this report) to support development of a coherent framework of goals, objectives, and activities to support climate adaptation work.

2. Identifying how proposed activities will engage stakeholders and other government authorities.

3. Linking proposed adaptation activities to Nation Plans. This includes identifying which KPIs will be used to measure progress.

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

5. Providing definitions for terms used

Specifically, regarding the Energy sector, the strategic climate adaptation objective provided is *"Diversification of energy systems to reduce vulnerability of hydropower from climate change"*. While this is indeed a sound climate adaptation strategy, the framing misses' important opportunities for developing a more robust climate adaptation strategy.

Goal Statement: The climate adaptation strategy for the energy sector is based on a two-pronged strategy: (i) climate proofing hydropower investments and (ii) diversifying RE energy sources (solar, wind, etc.). However, it might benefit from having an overarching adaptation goal. The following draft goal is proposed for consideration and discussion:

- Enhance the climate resilience of Bhutan's energy sector by diversifying renewable energy generation, distribution and storage options while mitigating climate impacts on infrastructure and services.

Additional Objectives and activities: If Bhutan is to increase the contribution of other renewable energy (RE) alternatives then the adaptation strategy should also address how:

- development of energy storage solutions and distribution networks (including SMART grids) will be done to support new generation capacities that provide safe, affordable power to all sectors.
- climate risks will be mitigated/managed when developing new RE generation, storage and distribution infrastructure.
- improvements in energy efficiencies can be used to complement the need to increase RE generation capacities (especially in energy intensive sectors through deployment of technologies and improved processes).
- Provisions can be made for households and businesses to install their own RE generation solutions. This could include provisions for buy-back where households and businesses can sell surplus energy back to the grid.
- PPPs and PPAs can be used to finance the deployment of infrastructure.
- Existing policy frameworks and governance capacities may be enhanced to support the above adaptation objectives and activities., buy-back scheme may need to be improved.

Other areas that Bhutan's climate adaptation program for energy could address include:

- Enhancing RE energy access and affordability to consumers and business through incentives and finance programs
- Promoting stakeholder engagement and awareness regarding in RE rollout and energy efficiency benefit
- Improved data on energy production and demand, linked to climate impacts consequential to both.
- How resource mobilization efforts for RE can be strengthened by (i) tapping into innovative financing mechanisms (ii) developing a comprehensive program framework for prioritization of activities, tracking and resource mobilization efforts.

2.2 Proposed Logframework for Energy Sector Road Map

Table 2.1 on the following page presents the proposed log framework for the Energy 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 energy sector NAP. The table employs a simplified log framework 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 of 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.

This framework will require a second round of reviews to solicit inputs from (i) other departments within the lead ministry, (ii) other sectoral government agencies, (iii) senior management.

Table 2.1 Draft Energy Sector Road Map

Challenge: Climate change is projected to (i) cause drier winters, reducing the seasonal potential for hydroelectricity generation (ii) increase sediment levels during monsoons leading to higher operation and maintenance costs, and (iii) increase risks from GLOFs impacting dam structures.			
Goal: Increase the climate resilience of Bhutan's energy sector by diversifying renewable energy generation, distribution and storage options while mitigating climate impacts on infrastructure and services.			
Objective	**Activities**	**KPIs**	**Risks**
Objective 1: Increase renewable energy generation options and capacities to meet growing sectoral energy needs.	1.1 Assess opportunities for increasing renewable energy use by type of RE solution and by sector under the AREP program (Alternative Renewable Energy Program) This will be done by: ● Assessing the feasibility of energy storage, transmission and generation technologies ● Short Term Activity 1.1 Assessment and development of green hydrogen roadmap ● Developing a National Energy Data Management System to evaluate energy usage by sectors and identify any interventions required (added generation capacity, energy efficiency needs, etc.)	Report on current energy use by sector, activity and renewable energy type. Also captures current RE use, projections, and barriers to adoption. Assessment/feasibility report published. Energy projections updated for each sector and activity. National Energy Data management system developed.	Lack of relevant baseline data. Lack of cooperation from private sector stakeholders Lack of appropriate technologies including the O&M capacities
	1.2 Update policies, legislation, and regulations that support diversification of renewable energy generation options, storage and distribution systems as an adaptation strategy to climate change.	Number of policies and incentives updated to support diversification of renewable energy generation, storage and distribution, buy-back, net metering, etc.	Regulatory hurdles that impede alternative renewable energy project development.

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Objective	**Activities**	**KPIs**	**Risks**
	● Include RE rollout as green investment in the upcoming Green Financing Guidelines of the RMA. This can boost private sector investment in RE rollout	Inclusion of RE as a green sector for investment in Green Financing Guidelines, RMA Incentives introduced to support the diversification of RE.	Ineffective implementation of policy recommendations
	1.3 Enable citizens and private sector investment in RE rollout and financing. ● Ensure regulations allow property owners to install their own RE solutions and share with grid (net-metering) ● Enable power purchase agreements (PPAs) to support business. ● Enable PPPs to help finance RE generation, storage and distribution. ● Introduce innovative financing mechanisms to enable private investment. ● Improve access to finance for installation of Solar PV at household level.	Amount of private sector investment secured. Regulations updated to allow RE installations on property. Number of power purchase agreements (PPAs) implemented. Number of PPPs implemented.	Regulations prohibit private sector investment or delay construction of RE projects. Privatised utilities resist opening the energy generation market. Lack of appropriate change in building codes
	1.4 Expand government investment in renewable energy generation, storage and transmission and distribution infrastructure.	Annual % increase in RE demand from households, commercial, industrial, and transport sectors.	Limited finance capacity by the government to invest in renewable energy

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Objective	**Activities**	**KPIs**	**Risks**
	• Short Term Activity 1.3: Promote development of decentralised renewable energy systems with public and private partners. • Augmentation of domestic power system and Smart Grid implementation • Bhutan engages in regional energy markets with India, Nepal, and Bangladesh • Promote energy storage solutions. • Medium Term activity 1.3 b: DOE to install Solar Water Heating System • Deploy solar panels and windmills on farms (integrated energy systems) for optimal land use.	Annual % increase in renewable energy, storage and distribution capacity. Participation into regional power market beyond inter-government model in power sale	generation and storage projects. Distribution network limits impact of additional capacity Low participation of private sector in developing RE infrastructures Disagreement from government partner in power trading.
	1.5 Promote the adoption of renewable energy solutions in the transport sector. • Enhance and ensure set-up of enabling infrastructures for switch over to RE (including charge stations, transmission lines, etc) • Introduction of incentives to adopt EVs	Percentage of transport sector energy needs met with renewables. Number of charge stations nationally	Investment in fossil fuel vehicles and gas stations acts as barrier to adoption of renewables in the transport sector. Limited adoption of EVs uptake

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Objective	**Activities**	**KPIs**	**Risks**
	• Increase awareness of negative impacts of traditional combustion engines.		
Objective 2: Enhance Renewable Energy Security and Affordability.	2.1 Increase energy access through promotion of renewable energy in remote areas.	% increase in renewable energy access in targeted areas. Area covered by new distribution networks in remote areas	Distribution network prohibits access to remote communities.
	2.2 Subsidize renewable energy installations for low-income households.	Number of subsidized renewable energy installations by type. .	Limited funding available to support subsidies. Inadequate focus on exploring innovative mechanisms for RE adoption. Technological barriers for energy-efficient solutions.
	2.3 Promote energy storage solutions at community level	Number of battery storage facilities	Limited access to storage solutions Limited ability to maintain and repair energy storage

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Objective	**Activities**	**KPIs**	**Risks**
Objective 3: Improve energy efficiency with a focus on energy intensive sectors.	3.1 Ensure national policy and regulatory frameworks support energy efficiency across sectors ● Undertake a review of relevant policies, regulations and guidelines across sectors to identify opportunities for strengthening existing legislation. ● Implement fixes to legislation. ● Develop requisite institutional capacities to promote and enforce new regulations. ● Monitoring and evaluating compliance with new efficiency standards.	Number of updated policies and regulations across sectors Number of training sessions conducted with staff on new regulations. Updates to M&E systems to capture efficiency measures	Lack of incentives from key sectors to undertake necessary policy reforms.
	3.2 Implement energy audits and assessments of key energy intensive sectors and activities.	Percentage reduction in energy intensity (energy use per unit of output) in audited sectors. Total energy savings achieved through audit recommendations. Number of businesses and industries audited for energy efficiency.	Lack of energy auditors in the industry and building sectors Limited participation from businesses in energy audits. Data accuracy and completeness in audit assessments.

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Objective	**Activities**	**KPIs**	**Risks**
	3.3 Develop and rollout out national energy efficiency standards, regulations and programs in energy intensive sectors (strategic action 1.2) ● Promote energy-efficient technologies to reduce overall energy use and costs. This could include (i) developing minimum energy performance standards (MEPs) and labeling (ii) piloting energy efficient technologies and (iii) studying investment opportunities for energy efficient technologies. ● Promote building energy efficiency certification and codes of practice. ● Set and enforce energy benchmarking in the energy intensive sectors. ● Establishment of testing laboratory for energy efficient appliances ● Upscaling the implementation of E cooking and improved cookstoves	Development and approval of energy efficiency standards and regulations. Regular updates are available to stakeholders of the latest technologies and opportunities for cost savings from energy efficiency applications. Increased level of uptake of technologies and approaches reported by industry associations. Percentage of businesses and industries complying with the newly implemented standards. Reduction in average energy expenditure for households, business and industries Reduction in energy consumption attributed to regulatory compliance. Number of stakeholders engaged in the standards and regulations development process.	Delays in the development and approval of standards. Lack of resources or expertise Resistance from industry stakeholders. Balancing stringent standards with industry competitiveness. Difficulty in monitoring and enforcing compliance. Communication challenges ensuring business and public understanding and support regulations. Evolving technology landscape requiring frequent updates to standards.

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Objective	**Activities**	**KPIs**	**Risks**
		Public perception and awareness of energy efficiency standards and regulations.	
	3.4: Develop institutional capacities of regulatory bodies and groups to meet energy efficiency standards: ● Conduct an assessment to identify the specific training needs of both regulatory bodies and stakeholder groups. ● Develop customized training programs and materials tailored to the identified needs. ● Institutionalize training programs to ensure sustainability of these efforts. ● Organize workshops, seminars, and training sessions for regulatory bodies and groups. ● Provide technical support and resources to stakeholders. ● Short Term Activity 2.5 Certification of energy professional as energy auditors	% of regulatory personnel and stakeholder groups that complete the prescribed training programs. Number and % of regulatory bodies and groups trained. Number and % of regulatory bodies implementing energy efficiency standards. Average response time to inquiries and requests for technical assistance. Number and % of businesses and industries compliant with efficiency standards	Data privacy concerns from private sector stakeholders may limit assessment efforts. Limited resources, including funding and qualified trainers. Resistance to adopt new approaches or technologies. Training may not lead to efficiency improvements. Enforcement of new standards may a challenge
	3.5: Develop financial incentives for investing in energy efficiency for key stakeholder groups	Number of private and public investment leveraged through financial incentives and financing programs.	Limited funding availability for incentives and financing.

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Objective	**Activities**	**KPIs**	**Risks**
		Increase in the number of energy-efficient projects funded. Percentage of businesses and consumers using financial incentives.	Difficulty in ensuring equitable access to financial support.
	3.6: Develop awareness and outreach strategies to promote energy efficiency and cost savings to select stakeholder groups and public.	Surveys or polls measuring stakeholder group and public awareness and understanding of energy efficiency issues. Increase in inquiries and participation in energy efficiency programs.	Difficulty in achieving stakeholder and/or public engagement and awareness. Lack of targeted communication channels to support outreach.
Objective 4: Ensure renewable energy generation, storage, and distribution facilities are resilient to climate change impacts.	4.1 Assess climate change risks and vulnerabilities for renewable energy generation and storage facilities as well as transmission and distribution networks. ● Integrate climate hazard screening into environmental impact assessments (EIAs) for new renewable energy projects.	Number of identified climate risks for RE facilities by geographic location. Severity ratings of identified risks (e.g., low, moderate, high). Percentage of identified vulnerabilities addressed through mitigation measures.	Incomplete identification of climate-related risks could lead to maladaptation in the energy sector. Underestimation of the severity of identified risks.

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Objective	**Activities**	**KPIs**	**Risks**
	• Analyze climate data to identify potential risks and vulnerabilities specific to project types and locations. • Incorporate climate risk screening into land-use planning to guide site selection.		Insufficient resources for conducting the assessment.
	4.2 Implement necessary infrastructure improvements, design criteria and upgrades to enhance infrastructure resilience against climate-related risks, ensuring the continuous operation of renewable energy generation, storage, and distribution facilities.	Number of resilience enhancements completed. Percentage increase in facility resilience compared to baseline. Reduction in downtime or disruption due to climate events.	Delays or cost overruns in implementation. Technical challenges in executing enhancements. Inadequate funding for necessary improvements. Adoption of 'siloed approach' in addressing the risks from CC on RE sector and increasing maladaptation.
	4.3 Develop and regularly update emergency response plans specific to climate-related events to safeguard renewable energy facilities and maintain uninterrupted energy supply.	Completion of emergency response plans. Frequency of plan updates. Training and drills conducted for response teams.	Inadequate communication during emergencies. Lack of coordination with local authorities.

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Goal: Increase the climate resilience of Bhutan's energy sector by diversifying renewable energy generation, distribution and storage options while mitigating climate impacts on infrastructure and services.			
Objective	**Activities**	**KPIs**	**Risks**
			Insufficient training for response teams.
	4.4 Establish a robust system for monitoring climate-related data, such as weather patterns and environmental conditions, to detect early warning signs that could impact renewable energy generation, storage, and distribution.	Frequency of data collection and analysis. Accuracy of predictive models. Timeliness of warnings and alerts.	Data collection and analysis errors. Failure to respond to early warning signs. Outdated monitoring equipment. Single hazard focus results in insufficient understanding of multi-hazard risks.
Objective 5: Promote Stakeholder Engagement and Awareness	5.1 Launch public awareness/behavior change campaigns highlighting the benefits of renewable energy and energy efficiency and storage.	Number of awareness campaigns conducted for renewables and energy storage.	Budget constraints for awareness campaigns.
	5.2 Facilitate community involvement in renewable energy projects	Level of community involvement in renewable and energy storage projects.	Resistance to change among communities.

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Goal: Increase the climate resilience of Bhutan's energy sector by diversifying renewable energy generation, distribution and storage options while mitigating climate impacts on infrastructure and services.			
Objective	**Activities**	**KPIs**	**Risks**
	5.3 Creating awareness of incentives and support mechanisms for self-financed renewable and energy storage installations.	Access rate to incentives and supports for self-financed renewable and energy storage installations.	Inadequate support for self-financing mechanisms for renewables and energy storage.

2.3 Risk Management Strategy

The Energy sector's climate adaptation priorities have 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 list of mitigation measures has been identified that can reduce unnecessary exposure these risks. Some of these will have cost implications that need to be incorporated into project design and budgets.

Objective 1: Increase renewable energy alternatives and capacities to meet growing sectoral energy needs.

Activity	Risk	Mitigation Measure
1.1 Assess opportunities for increasing renewable energy alternatives use by type and by sector.	Insufficient data and analysis may lead to inaccurate assessment and missed opportunities. Lack of cooperation from private sector stakeholders Lack of appropriate technologies including the O&M capacities Limited finance support from government for conducting feasibility studies.	Carry out data collection and assessments on renewable energy options by type and sector. Partner with industry groups, universities, relevant ministries, and donors to pool climate change resources Identify appropriate technologies through R&D and South-South learning. Investigate opportunities to leverage domestic as well as co-financing from donors/development partners
1.2 Update policies, legislation, and regulations that support diversification to build resilience of renewable energy generation options, storage and distribution systems.	Resistance to policy changes and regulatory hurdles from stakeholders or industry. Regulatory hurdles impede alternative renewable energy project development. Ineffective implementation of policy recommendations	Engage in extensive stakeholder consultation and communication to build consensus and address concerns. Offer incentives or transition plans to ease the impact on affected parties.
1.3 Enable citizens and private sector to participate in RE rollout and financing.	Regulations prohibit private sector investment or delay construction of RE projects. Privatized utilities resist opening energy generation market. Lack of appropriate change in building codes	Undertake regulatory review to streamline approval of RE projects. Create enabling environment for prosumers.

Activity	Risk	Mitigation Measure
		Review import laws, taxes, etc. and target best cost RE solutions for Bhutan. Review and improve the existing building codes
1.4 Expand government investment in renewable energy generation, storage and distribution infrastructure.	Limited finance capacity by government to invest in renewable energy generation and storage projects. Distribution network limits impact of additional generation capacity. Low participation of private sector in developing RE infrastructures. Disagreement from government partner in power trading.	Collaborate with other ministries to explore synergies in funding through national investments. Explore using public-private partnerships to access private sector funding. Carry out proper study and analysis for system upgrade. Access international climate financing from donors
1.5 Promote the adoption of renewable energy solutions in the transport sector.	Investment in fossil fuel vehicles and gas stations acts as barrier to adoption of renewables in the transport sector. Lack of charge stations and EV repair capabilities acts as barrier to EV adoption. Limited uptake of EVs due to higher costs.	Government operations lead adoption of EVs for their fleets. Promote retrofitting of existing vehicles Offer financial incentives for the adoption of electric vehicles. Deploy EV charging stations

Objective 2: Enhance renewable energy access and affordability.

Activity	Risk	Mitigation Measure
2.1: Improve renewable energy access in remote areas.	Distribution networks prohibit access to remote communities.	Consider promoting decentralized grids and energy generation facilities
	Geographic and environmental challenges for remote mountainous areas	Conduct EAs to minimize adverse impacts. Use wind and solar solutions that are easy and inexpensive to transport.
	High initial costs and potential debt	Implement small scale projects that are easier to finance.

Activity	Risk	Mitigation Measure
		Use international finance, green bonds and other innovative finance mechanisms.
2.2: Subsidize renewable energy installations for low-income households.	Limited funding available to support subsidies, which could limit the program's scale and impact.	Work with the Ministry of Finance and Ministry of Infrastructure and Transport to secure adequate funding for subsidy programs and explore opportunities for budget reallocation. Include household level RE installation as an activity eligible for funding from FI based on RMA's Green Financing Guidelines. Partner with private and financial institutions to develop and implement financing options for low-income households
2.3 Promote energy storage solutions at community level	Technological barriers for energy-efficient solutions.	Study to adopt appropriate and viable technologies

Objective 3: Improve energy efficiency with a focus on energy intensive sectors.

Activity	Risk	Mitigation Measure
3.1: Ensure national policy and regulatory frameworks support energy efficiency across sectors	Lack of incentives from key sectors to undertake necessary policy reforms.	Develop sectoral targeted data sets on energy efficiency and cost savings
3.2: Implement energy audits and assessments of key energy intensive sectors and activities	Lack of energy auditors in the industry and building sectors Limited participation from businesses in energy audits. Data accuracy and completeness in audit assessments.	Undertake capacity building and certification of energy auditors. Partner with industry and building associations to implement energy audits. Ensure standardized approach used for undertaking audits that allows comparison across sectors if/when required.
3.3 Develop and rollout out national energy efficiency	Delays in the development and approval of standards.	Streamline the role of standards development to one agency.

Activity	Risk	Mitigation Measure
standards and regulations.	Lack of resources and expertise for the development and implementation of standards. Opposition to the regulatory changes from industry stakeholders. Balancing stringent standards with industry competitiveness. Difficulty in monitoring and enforcing compliance. Communication challenges in ensuring public understanding and support for the regulations. Evolving technology landscape requiring frequent updates to standards.	Partner with Ministry of Information and Communications to launch public awareness campaigns highlighting the benefits of energy efficiency. Partner with Ministry of Education to integrate energy efficiency information into the school curriculum. Engage with industry stakeholders to address concerns and foster support. Partner with international energy bodies, NGOs, etc. to understand lessons learned. Invest in automated monitoring tools and partner with industry associations for reporting. Use phased or tiered energy efficiency standards. Regularly review standards to ensure alignment with advancements in technology.
3.4: Develop capacities of regulatory bodies and groups to meet energy efficiency standards.	Data privacy concerns from private sector stakeholders may limit assessment efforts. Limited resources, including funding, testing facilities and qualified trainers. Resistance to adopting new approaches or technologies. Training may not lead to efficiency improvements. Enforcement of new standards may be a challenge	Only report aggregate data rather than individual business Partner with organizations that already have qualified trainers. Use online training resources. Engage industry champions to talk about benefits. Offer post-training support. Implement a phased approach to enforcement, starting with awareness campaigns followed by

Activity	Risk	Mitigation Measure
		soft enforcement before introducing penalties.
3.5: Develop financial incentives for investing in energy efficiency for key stakeholder groups	Limited funding availability for incentives and financing. Difficulty in ensuring equitable access to financial support.	Seek alternative funding sources with financial institutions, international grants, or green bonds. Develop clear eligibility criteria, prioritizing high-impact activities. Implement a transparent application and selection process
3.6: Develop awareness and outreach strategies to promote energy efficiency and cost savings to select stakeholder groups and public.	Difficulty in achieving stakeholder and/or public engagement and awareness. Lack of targeted communication channels to support outreach.	Partner with media groups, NGOs and industry groups to support outreach and communication efforts. Ensure trained communication experts are used to develop and implement outreach activities.

Objective 4: Ensure renewable energy generation, storage, and distribution facilities are resilient to climate change impacts.

Activity	Risk	Mitigation Measure
4.1 Assess climate change risks and vulnerabilities for renewable energy generation and storage facilities as well as transmission and distribution networks.	Incomplete identification of climate-related risks. Underestimation of the severity of identified risks. Insufficient resources for conducting the assessment.	Engage transdisciplinary team to ensure a holistic risk assessment. Use third-party evaluators to validate results of risk assessments. Seek partnerships with academic institutions, NGOs, or international donors to support work
4.2 Implement necessary infrastructure improvements, design criteria and upgrades to enhance resilience against climate-related threats, ensuring the continuous operation of renewable energy generation, storage, and distribution facilities.	Delays or cost overruns in implementation. Technical challenges in executing enhancements. Inadequate funding for necessary improvements.	Use a project management system that identifies cost overruns. Collaborate with technology providers and industry experts to support implementation. Explore using green bonds, international grants, or PPPs to support resilience-building activities.

Activity	Risk	Mitigation Measure
4.3. Develop and regularly update emergency response plans specific to climate-related events to safeguard renewable energy facilities and maintain uninterrupted energy supply.	Inadequate communication during emergencies. Lack of coordination with local authorities. Insufficient training for response teams.	Establish a dedicated communication channel and protocol for emergencies, ensuring stakeholders are informed in real-time. Work with local authorities during the planning phase to ensure alignment of resources and efforts during emergencies. Regularly conduct drills and training sessions for response teams, backstop with online training
4.4 Establish a robust system for monitoring climate-related data, such as weather patterns and environmental conditions, to detect early warning signs that could impact renewable energy generation, storage, and distribution	Data collection and analysis errors. Outdated monitoring equipment produces low quality data. Single hazard focus results in insufficient understanding of multi-hazard risks.	Engage experts for data validation to ensuring accuracy of information collected. Schedule regular maintenance checks for equipment, and budget for periodic upgrades. Establish multi-hazard early warning system.

Objective 5: Promote Stakeholder Engagement and Awareness

Activity	Risk	Mitigation Measure
5.1 Launch public awareness campaigns highlighting the benefits of renewable energy and energy storage.	Budget constraints for awareness campaigns	Partner with media agencies and not for profits already doing this work to leverage resources
5.2 Facilitate community involvement in renewable energy projects	Resistance to change among communities.	Ensure benefits of renewable energy alternatives are made available in language and a format that is understandable
5.3 Creating awareness of incentives and support mechanisms for self-financed renewable and energy storage installations.	Low access rate to incentives and supports for self-financed renewable and energy storage installations.	Carry out regular sensitization program and demonstrate technological viability through the proof of concepts

2.4 Institutional Arrangements for Implementation

The Department of Energy (DoE) at the Ministry of Energy and Natural Resources (MoENR) is the national focal point for all energy work in Bhutan. As such it has prepared the energy section of the 13FYP and will be responsible for ensuring that proposed objectives and activities of the Renewable Energy Sectoral Road Map are integrated with this plan. This will include formulating an annual performance agreement (APA) with various government agencies, local governments, and stakeholders.

DoE 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.

Institutional arrangements for implementing proposed objectives and activities follow.

Objective 1: Increase renewable energy alternatives and capacities to meet growing sectoral energy needs.

Activity	Lead & Collaborating Agencies
1.1 Assess opportunities for increasing renewable energy use by type of RE solution and by sector under the AREP program	DoE would lead this activity in collaboration with the following groups: • GovTech Agency • Druk Holding and Investments • Druk Green Power Corporation Limited, • Bhutan Power Corporation Limited • Other businesses to be determined
1.2 Update policies, legislation, and regulations that support diversification to build resilience of renewable energy options, storage and distribution systems.	DoE would lead this activity in collaboration with the following groups: • Cabinet • Ministry of Finance (MoF) • Electricity Regulatory Authority • Druk Green Power Corporation Limited, • Bhutan Power Corporation Limited
1.3 Expand investment in renewable energy generation, storage and, transmission and distribution infrastructure.	DoE would lead this activity in collaboration with the following groups: • Cabinet • Ministry of Finance (MoF) • Druk Green Power Corporation Limited, • Bhutan Power Corporation Limited • Bhutan Power System Operator
1.4 Enable citizens and private sector participation in RE rollout and financing.	DoE would lead this activity in collaboration with the following groups: • Bhutan Chamber of Commerce and Industry, • Association of Bhutan Industries • CSOs

Coordination of activities will be achieved through using mechanisms established through the Economic Cluster as well as through stakeholder consultations and engagement in planning and implementation of proposed adaptation activities.

Proposed adaptation work both aligns and impacts a wide range of existing policies, strategies, plans and programs listed in Table 2.0 below.

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

General: ● 13 Five Year Plan ● Bhutan's Climate Change Policy 2020 ● Bhutan's Nationally Determined Contributions (NDCs) 2021 Energy: ● Alternative Renewable Energy Policy (2013) ● Energy Efficiency Roadmap (2019) ● Renewable Readiness Assessment ● Domestic electricity tariffs ● Sustainable Hydropower Development Policy (2020) ● National Energy Efficiency Policy (2019), ● Long Term Low Greenhouse Gas Emission and Climate Resilient Development Strategy (LTS) 2023, ● Power System Master Plan 2040, ● National Transmission Grid Master Plan (2018), ● Renewable Energy Master plan (2017-2032), ● Guideline for Development of Distributed Energy Resource Systems (DERS) (currently being drafted)	Transport ● Surface Transport Policy ● Low Emission Development Strategy ● EV Road Map (current being drafted) ● Surface Transport and Industry (2021), ● Road Sector Master Plan (2007-2027), Health Agrifood ● Low Emissions Development Strategy for Food Security June 2021. Human Settlements: ● Energy Auditing and Reporting guideline – Buildings and Industry sectors 2020 ● Standards & Labeling scheme for appliances 2018 ● Energy Efficiency Codes of Practice for Industry 2020 ● Building code (currently being revised) ● Bhutan Green Building Guidelines 2013

Objective 2: Enhance energy access and affordability:

Activity	Lead & Collaborating Agencies
2.1: Implement renewable energy access in remote areas.	DoE would lead this activity in collaboration with the following groups: ● Department of Local Governance and Disaster Management (DoLGDM) ● Department of Infrastructure Development (DoID) ● Department of Forests and Park Services (DoFPS) ● Ministry of Agriculture and Livestock (MoAL)

	● Ministry of Health (MoH) ● Ministry of Infrastructure and Transportation (MoIT)
2.2: Subsidize renewable energy installations for low-income households.	DoE would lead this activity in collaboration with the following groups: ● Department of Local Governance and Disaster Management (DoLGDM) ● CSOs
2.3: Promote energy storage solutions at the community level	DoE would lead this activity in collaboration with the following groups: ● Department of Local Governance and Disaster Management (DoLGDM) ● Department of Infrastructure Development (DoID) ● Ministry of Agriculture and Livestock (MoAL)

The Department of Energy will coordinate activities through the Economic Cluster mechanism as well as with local governments and stakeholders through consultations and engagement in planning and implementation of proposed adaptation activities.

Proposed adaptation work both aligns and impacts general, energy and building policies shown below:

General: ● 13 Five Year Plan ● Bhutan's Climate Change Policy 2020 ● Bhutan's Nationally Determined Contributions (NDCs) 2021 Energy: ● Alternative Renewable Energy Policy (2013) ● Energy Efficiency Roadmap (2019) ● Renewable Readiness Assessment ● Long Term Low Greenhouse Gas Emission and Climate Resilient Development Strategy (LTS) 2023, ● Power System Master Plan 2040, ● National Transmission Grid Master Plan (2018), ● Renewable Energy Master plan (2017-2032), ● Guideline for Development of Distributed Energy Resource Systems (DERS) (currently being drafted)	Agrifood ● Low Emissions Development Strategy for Food Security June 2021. Human Settlements: ● Building code (currently being revised) ● Bhutan Green Building Guidelines 2013

Objective 3: Improve energy efficiency with a focus on energy intensive sectors.

Activity	Lead & Collaborating Agencies
3.1: Implement energy audits and assessments of key energy intensive sectors and activities	DoE would lead this activity in collaboration with the following groups: • DHS, • Bhutan Standard Bureau (BSB), • College and Science and Technology, • Jigme Namgyal Engineering college, • Industries.
3.2 Develop and rollout out national energy efficiency standards and regulations	DoE would lead this activity in collaboration with the following groups: • Bhutan Standard Bureau (BSB), • Association of Bhutanese Industries (ABI), • Bhutan Chamber of Commerce and Industry (BCCI) • Manufacturers, • Industries
3.3: Develop capacities of regulatory bodies and groups to meet energy efficiency standards	DoE would lead this activity in collaboration with the following groups: • Bhutan Standard Bureau (BSB), • DHS, • DoI, • Universities
3.4: Develop financial incentives for investing in energy efficiency for key stakeholder groups	DoE would lead this activity in collaboration with the following groups: • Association of Bhutanese Industries (ABI), • Bhutan Chamber of Commerce and Industry (BCCI) • Ministry of Finance • Commercial Banks • Insurance groups
3.5: Conduct research into pilot energy efficient technologies	DoE would lead this activity in collaboration with the following groups: • Universities • CSOs
3.6: Develop awareness and outreach strategies to promote energy efficiency and cost savings to select stakeholder groups and public.	DoE would lead this activity in collaboration with the following groups: • Ministry of Home Affairs and Department of Local Governance and Disaster Management (DoLGDM) • Ministry of Agriculture and Livestock (MoAL) • Ministry of Industry, Commerce and Employment (MoICE) • Ministry of Health Additional groups include: • Association of Bhutanese Industries (ABI), • Bhutan Chamber of Commerce and Industry (BCCI)

	• Media • CSOs

MoENR will coordinate activities through the Economic Cluster mechanism as well as by working closely with Industry Associations, Universities and media groups to plan and implement Objective 3 activities.

Proposed adaptation work aligns with Bhutan's 13 Five Year Plan as well as with general, energy and buildings policies and programs listed in Table 2.0.

Objective 4: Ensure renewable energy generation, storage, and distribution facilities are resilient to climate change impacts.

Activity	Lead & Collaborating Agencies
4.1 Assess climate change risks and vulnerabilities for renewable energy generation and storage facilities as well as transmission and distribution networks.	DoE would lead this activity in collaboration with the following groups: • Department of Local Governance and Disaster Management (DoLGDM) • Bhutan Power Corporation (BPC) • Druk Green Power Corporation (DGPC) Ltd
Activity 4.2 Implement necessary infrastructure improvements, design criteria and upgrades to enhance resilience against climate-related threats, ensuring the continuous operation of renewable energy generation, storage, and distribution facilities.	DoE would lead this activity in collaboration with the following groups: • Department of Infrastructure Development (DoID) • Department of Local Governance and Disaster Management (DoLGDM) • Private Sector Contractors
Activity 4.3. Develop and regularly update emergency response plans specific to climate-related events to safeguard renewable energy facilities and maintain uninterrupted energy supply.	DoE would lead this activity in collaboration with the following groups: • Department of Local Governance and Disaster Management (DoLGDM) • Department of Environment and Climate Change (DoECC) • Department of Local Governance and Disaster Management (DoLGDM) • Department of Infrastructure Development (DoID) • Private Sector Contractors
Activity 4.4 Establish a robust system for monitoring climate-related data, such as weather patterns and environmental conditions, to detect early warning signs that could impact renewable energy generation, storage, and distribution	DoE would lead this activity in collaboration with the following groups: • National Center for Hydrology and Meteorology (NCHM) • Department of Local Governance and Disaster Management (DoLGDM) • Department of Environment and Climate Change (DoECC)

MoENR will coordinate activities through the Economic Cluster mechanism as well as by working closely with Industry Associations, Universities and media groups to plan and implement Objective 4 activities.

Proposed adaptation work both aligns with Bhutan's 13 Five Year Plan as well as existing energy policies.

Objective 5: Promote Stakeholder Engagement and Awareness

Activity	Lead & Collaborating Agencies
5.1 Launch public awareness campaigns highlighting the benefits of renewable energy and energy storage.	DoE would lead this activity in collaboration with the following groups: • Department of Environment and Climate Change (DoECC) • Department of Local Governance and Disaster Management (DoLGDM) • Ministry of Industry, Commerce and Employment (MoICE) • CSOs • Media
5.2 Facilitate community involvement in renewable energy projects	DoE would lead this activity in collaboration with the following groups: • Department of Environment and Climate Change (DoECC) • Department of Local Governance and Disaster Management (DoLGDM) • Ministry of Industry, Commerce and Employment (MoICE) • CSOs • Media • Druk Green Power Corporation (DGPC) Ltd • Bhutan Power Corporation (BPC) • BPSO,
5.3 Establish incentives and support mechanisms for self-financed renewable and energy storage installations.	DoE would lead this activity in collaboration with the following groups: • Ministry of Finance (MoF) • Ministry of Industry, Commerce and Employment (MoICE) • Department of Infrastructure Development (DoID) • Commercial Banks • Insurance companies

MoENR will coordinate activities through the Economic Cluster mechanism as well as by working closely with Industry Associations, Universities and media groups to plan and implement Objective 4 activities.

Proposed adaptation work both aligns with Bhutan's 13 Five Year Plan as well as existing energy policies.

3 Awareness & Sensitization Plan

To ensure successful implementation of the Renewable Energy Road Map for NAP implementation, an awareness and sensitization plan is required to ensure key stakeholders:

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

3.1 Stakeholder Identification & Information Needs

The Renewable Energy 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 3.1 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 ministries: 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 Renewable Energy Road Map. 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 Energy sector. A list of these will need to be developed, however their engagement is likely crucial for achieving adaptation goals.

- Stakeholder groups: Beyond utilities, industry associations, other stakeholder groups will be important to engage in awareness raising activities, especially for 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 of Renewable Energy NAP sector objectives. Local NGOs should 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 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 is 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.

Table 3.1 Energy Stakeholder Awareness Needs to Support NAP Implementation				
Stakeholder Groups	NAP Role	Awareness Goals	Relevance to mandate	NAP Awareness Resource Availability
1. Government Ministries:				
Department of Energy (DoE) and Policy and Planning Division (PPD), Ministry of Energy and Natural Resources (MoENR):	Focal point for Energy NAP implementation	Understanding sectoral energy climate adaptation needs Aligning Energy NAP with department's development plan.	DoE is the national energy focal point for Bhutan	Not confirmed as we are in process of formulating a new plan.
Department of Climate Change (DECC), MoENR:	Bhutan Focal Point for all other NAP sectors	Staff need to understand links between renewable energy and other NAP sectors	Nationally designated authority for NAP and climate change	Unknown
Ministry of Finance	Resource mobilization, budget allocation and provision of incentives where feasible	Understanding the priorities of the energy NAP and energy development plan	Relevant as all projects and activities will need resources from MoF	Unknown
Ministry of Agriculture and Livestock	Focal point for Agri-food NAP implementation, and lead for climate adaptation activities in Bhutan's agrifood system.	Role of RE powering agrifood sector activities. Potential of agricultural lands to be used for RE projects. Role of climate adaptation and mitigating energy use in agrifood sector.	Relevant as Energy NAP encompasses projects related to Agri-solar, bio-energy and integrated energy system for optimal agriculture land use.	Unknown
Ministry of Foreign Affairs and External Trade	For multilateral collaboration with respect to mobilizing external resources including green financing, knowledge	In exploring and connecting with relevant investors and partners abroad		Unknown

	and technology through diplomacy. Implementation of NAP priorities in line with mandates			
Ministry of Industry, Commerce and Employment	Responsible for budget allocation for NAP activities, as well as industry, Facilitation of licensing and monitoring of implementation of NAP activities across industries and private sectors. Implementation of priorities in line with mandates	Understanding the energy NAP activities for industries to implement and accordingly direct through promotion activities	Relevant as they are the nodal agency for the industries, and they may have some facilitation role in license issuance, monitoring and anchoring NAP activities across industries.	Unknown
Ministry of Health:	Implementation of priorities in line with mandate	Understanding the importance of energy security in view of climate change and its role in the health sector	Relevant as Energy NAP encompasses projects related to health sector such as solarization of hospitals	Unknown
Ministry of Infrastructure and Transport	Infrastructure and water resource management NAP focal point for human settlements Implementation of priorities in line with mandates	Key partner in fossil fuel replacement and ensuring the growing risk to the settlements and the need to make the settlements climate resilient	Relevant as they have mandate regarding the surface transport fueled by fossil oils and human settlement	Unknown
Ministry of Home Affairs (MoHA).	MoHA oversees matters related to local governance, including those related to energy use	Understand how objectives and activities proposed in the Energy Sector Roadmap impact its work.	MoHA is likely responsible for some regulatory (?) clearances to	Unknown

		Understand opportunities for collaborating with other sectors to co-manage energy resources. Understand what resources are available to support its work.	implement Energy NAP activities such as energy efficiency in buildings and fortresses.	
Ministry of Education and Skills Development	Implementation of priorities in line with mandates	Understand how objectives and activities proposed in the Energy Sector Roadmap impact its work. Understand opportunities for collaborating with other sectors to co-manage energy resources. Understand what resources are available to support its work.	Relevant as it climate change landscape requires advocacy, long term capacity and skill development	Unknown
National Centre for Hydrology and Meteorology	Provide weather forecast and climate information and understand the requirement of weather and climate information of co-production of early warning services	Understand how objectives and activities proposed in the Energy Sector Roadmap impact its work. Understand opportunities for collaborating with other sectors to co-manage energy resources. Understand what resources are available to support its work.	Nodal agency to generate and disseminate weather forecast	Unknown
2. Industry Associations:				
Bhutan Chamber of Commerce & Industry (BCCI):	Engaging and mobilizing the private sectors	Potentially a key partner in disseminating information on RE opportunities for private sector engagement	Mobilizing resources and implementation of NAP activities	Unknown

Association of Bhutanese Industries	Implementation of NAP activities	Understanding the NAP priorities and being informed on the role of industries in climate adaptation.	Engagement of industries and awareness on energy efficiency measures	Unknown
3. Major Businesses:				
Druk Green Power Corporation (DGPC):	DGPC is the national energy generation utility company, playing a vital role in the country's renewable energy landscape.	As the main implementer of the energy generation projects in the country, climate change aspects play a major role in ensuring energy security.	Main energy generation utility company	Unknown
Bhutan Power Corporation Limited	BPC is the national transmission and distribution utility company catering the energy needs across all consumers	As the main transmission & distributing utility, climate resiliency in the T&D systems plays a major role in the ensuring uninterrupted supply of energy.	Main power transmission and distribution company	Unknown
Local manufacturers/suppliers	Essential partner in improving and ensuring the adaptive supply of the RE and EE technologies	Keeping them informed on the NAP priorities and their contribution for market transformation	They can be key partners in bringing market transformation in the energy sector	Unknown
4. Not-for-profits/NGOs:				
Bhutan Trust Fund for Environmental Conservation (BTFEC):	An independent organization, BTFEC supports many environmental projects, including those related to renewable energy and sustainable energy practices.	To communicate the priorities of RGoB in terms of Energy NAP for resources mobilization and other assistance	BTFEC supports and funds environmental projects including renewable energy	Upcoming support in solarization projects in the remote areas and enhancing the solar generation through innovative financing models
WWF Bhutan: World Wildlife Fund (WWF)	WWF has a presence in Bhutan and, while primarily an environmental conservation organization, they engage in projects that intersect with renewable energy, especially in	To communicate the priorities of RGoB in terms of Energy NAP for resources mobilization and other assistance	Relevant in terms of implementation of some projects or for mobilization of resources	Upcoming support in the capacity building of energy auditors and also increasing RE generation

	the context of preserving habitats and reducing human-wildlife conflict.			
Bhutan For Life	Legal entity established to support the achievement of robust network of Protected Areas (PA) that contributes to biodiversity conservation, human-well-being, and increases Bhutan's resilience to the effects of climate change by providing long-term financing.	To communicate the priorities of RGoB in terms of Energy NAP for resources mobilization and other assistance	Relevant in terms of implementation of some projects or for mobilization of resources	Unknown
Bhutan Ecological Society:	This organization promotes research, knowledge-sharing, and best practices in ecological conservation, which includes discussions and projects on sustainable and renewable energy.	To undertake research and collaborate in implementation of some energy NAP activities including knowledge sharing and	Relevant as their mandate scope covers renewable energy.	Unknown
Tarayana Foundation:	While its primary focus is not renewable energy, this foundation engages in holistic rural development, which sometimes includes clean and sustainable energy solutions for remote communities.	Potential partner in increasing the outreach of the beneficiaries and also aligning their micro-financing window in the NAP activities	Relevant as they are continuously involved in area of RE but emphasis on the NAP energy needs to be disseminated	Unknown
5. Universities/Research Institutions:				

Renewable Natural Resources Research and Development Centre (RNR-RDC):	While their primary focus lies on natural resources, they engage in research and initiatives that intersect with renewable energy, especially biomass.	For importance of Research and development on NAP activities and energy related matters	Relevant they can bring out research and insights in energy related matters as an academic institution.	Resource support in the form of R&D and incorporating adaptation component in the curriculum
College of Science and Technology	One of the technical institutes providing master in renewable energy, undertaking R&D in RE and fostering research to the government agencies	To enhance human resources, R&D in RE technologies, establish testing facilities that can accelerate the RE generation	Pertinent in RE curriculum, R&D and aligning with the climate change goals of the country	Resource support in the form of R&D and incorporating adaptation component in the curriculum
Jigme Namgyel Engineering College	A technical institute that offers degree in power engineering which is an important element to ensure the climate resiliency of the power systems as it directly studies the technical aspects.	Potential partner in enhancing the human resources	Pertinent in RE curriculum, R&D and aligning with the climate change goals of the country	Resource support in the form of R&D and incorporating adaptation component in the curriculum
6. Other Stakeholders				
Private sector organizations	Key players for undertaking renewable energy projects. Potential funding partners	Identify vulnerability and risks to operations that climate change poses. Identify their role in the implementation of NAP activities as well as opportunities for partnership and investment	Key proponents in undertaking RE projects Potential investors in RE projects	Interests already shown but need to provide the right platform for them to collaborate in the NAP implementation and also provide them with the necessary tools.
7. International Agencies:				
Asian Development Bank	Mobilize resources to implement the NAP priorities	Understand how proposed energy sector activities align with its funding priorities.	IFI to provide financing	Continuous support in the form of TA,

		Understand alignment of proposed NAP work with 13 FYP and existing policies.		Grant and concessional loan
United Nations Development Programme (UNDP)	UNDP is actively engaged in supporting the development of Bhutan's NAP for renewable energy sector and for providing the technical and financial support	Understand how proposed energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	UNDP provides technical assistance in renewable energy and supports in accessing the climate financing	Continuous support in the form of TA, Grant and now enhancing RE generation with innovative financing mechanisms
Other UN Agencies	Mainstreaming and support in mobilizing TA and financial resources	Understand how proposed energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Agencies support the implementation of climate change	Continuous support provided in exploring innovative technologies in the energy sector
World Health Organization (WHO):	Sensitize on the linkage between health and climate change	Understand how proposed energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Strategic support and advice on health-related matters	
World Bank	Mobilize resources to implement the NAP priorities	Understand how proposed energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	IFI to provide financing	Continuous support in resource mobilization

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 energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	For resource mobilization and technical assistance	
USAID	USAID is actively engaged through their various programs in providing technical assistance.	Understand how proposed energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	USAID is committed to promoting sustainable development and addressing climate change.	Current resource support for green hydrogen
International Solar Alliance (ISA)	Deployment of solar energy technologies as a means for bringing energy access, ensuring energy security and driving energy transition	Understand how proposed energy sector activities align with its funding priorities. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Committed in development and deployment of transformational energy solutions powered by the sun	Joining the alliance has enhance the collaborating platform for the energy sector under which some of the outcomes have been realized
International Centre for Integrated Mountain Development (ICIMOD)	Intergovernmental organization that renders technical assistance, disseminate knowledge and facilitate research and innovation to the Hindu Kush regions	Understand how proposed energy sector activities align with its funding priorities and technical assistance. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Technical assistance in RE, Agri PV.	Technical support provided in implementing the mandates in the energy sector
International Renewable Energy Agency (IRENA)	Plays a pivotal role in advancing sustainable energy solutions globally	Understand how proposed energy sector activities align with its funding priorities.	Technical assistance in renewable energy	Technical support provided in implementing the mandates in the energy sector

		Understand alignment of proposed NAP work with 13 FYP and existing policies.		
ICLEI-South Asia	Works with the local governments for sustainability with direct focus on the cities	Understand how proposed energy sector activities align with its funding priorities and technical assistance. Understand alignment of proposed NAP work with 13 FYP and existing policies.	Potential partner in the NAP implementation and resource mobilization	Energy sector seen as a key partner in building the resilience of the city which has enabled DoE to contribute to the actions under city's mandate
Japan International Cooperation Agency	Engaged in various program related to hydropower planning, power system strengthening, development and capacity building	Understand how proposed energy sector activities align with its funding priorities and technical assistance. Understand alignment of proposed NAP work with 13 FYP and existing policies	Technical assistance in hydropower projects, storage technology and power systems	

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 Energy Sector Roadmap its goals and objectives. To this end the following activities should be undertaken:

- Sensitization and awareness: Ministries can plan to host an inaugural event for the Energy Sector 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 Energy 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 climate change can be integrated within the Renewable Energy sector both vertically and horizontally. The discussions could center around:

- integration with existing policies, strategies, programs.
- coordination with other ministries and stakeholders.
- supporting implementation by strengthening existing tools, budgets and resources.
- monitoring and reporting 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 Energy Sector Roadmap Rollout

It will also be important for ministry staff and key stakeholders to be aware of available resources, financing, and tools 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 Energy Sector Roadmap (and roadmaps for 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).[1] 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.[2] 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 an 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.

[1] Source : https://thecompassforsbc.org/how-to-guide/how-develop-monitoring-and-evaluation-plan
[2] 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 projects 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: Fata 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 Renewable Energy 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 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 done 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.