Environmental and Social Impact Assessment and Environment and Social Management Plan for Construction of Integrated Water Supply (Irrigation and Drinking water supply) for 6 Gewogs

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LIST OF ACRONYMS

ACREWAS	Advancing Climate Resilience of the Water Sector
AOI	Area of Influence
BAP	Biodiversity Action Plan
BDBL	Bhutan Development Bank Limited
BHU	Basic Health Unit
BIL	Bhutan Insurance Limited
BNB	Bhutan National Bank
BOB	Bank of Bhutan
BPT	Break Pressure Tank
BTFW	Border Town Foreign Workers
CAT	Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CF	Community Forest
CFMG	Community Forest Management Group
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNR	College of Natural Resources
CoC	Code of Conduct
CRPD	Convention on the Rights of Persons with Disabilities
CSA	Climate Smart Agriculture
CSD	Convention on Biological Diversity
CSO	Civil Society Organization
DE	District Engineer
DEMC	Dzongkhag Environment Management Committees
DI	Ductile Iron
DoA	Department of Agriculture
DoCDD	Department of Culture and Dzongkha Development
DECC	Department of Environment & Climate Change
DoFPS	Department of Forests and Park Services
DoI	Department of Infrastructure
DoID	Department of Infrastructure Development
DoL	Department of Land
DoL	Department of Livestock
DoW	Department of Water
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DWMC	Dzongkhag Water Management Committee
EA	Environment Assessment
EC	Environmental clearance
ECCD	Early Childhood Care and Development
ECR	Extended Classroom
EHS	Environmental Health and Safety
ESIA	Environment and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan

ESS	Environmental and Social Safeguards
FC	Forest Clearance
FCR	Ferro Cement Reservoir
FGD	Focused Group Discussion
FNCA	Forest and Nature Conservation Act
FNCRR	Forest and Nature Conservation Rules and Regulations
FPIC	Free Prior and Informed Consent
FYP	Five Year Plan
GAP	Gender Action Plan
GAO	Gewog Administrative Officer
GBCL	Green Bhutan Corporation Limited
GBV	Gender-Based Violence
GCF	Green Climate Fund
GEF	Global Environment Facility
GH	Greater Himalaya
GI	Galvanized Iron
GLOF	Glacial Lake Outburst Flood
GRM	Grievance Redress Mechanism
HDPE	High Density Polyethylene
HH	Household
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ICERD	International Convention on the Elimination of All Forms of Racial Discrimination
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
JSWNP	Jigme Singye National Park
LEA	Labour and Employment Act
LG	Local Government
LH	Lesser Himalayan
LMP	Labour Management Plan
MoAL	The Ministry of Agriculture and Livestock
MoENR	Ministry of Energy and Natural Resources
MOF	Ministry of Finance
MoIT	Ministry of Infrastructure and Transport
MTR	Mid-term Review
NAP	National Adaptation Plan
NCD	Nature Conservation Division
NCHM	National Centre for Hydrology and Meteorology
NCWC	National Commission for Women and Children
NECS	The National Environment Commission Secretariat
NEPA	National Environmental Protection Act
NFE	Non-formal Education
NRDCL	Natural Resources Development Corporation Limited
NWFP	Non-Forest Wood Products
NGEP	National Gender Equality Policy
NGO	Non-government Organization

NIWRMP	National Integrated Water Resources Management Plan
NSB	National Statistics Bureau
NWFP	Non-Wood Forest Product
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHSW	Occupational Health, Safety and Welfare
OP-CRC-AC	Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict
OP-CRC-SC	Optional Protocol to the Convention on the Rights of the Child and the sale of children, child prostitution and child pornography
PES	Payment for Ecosystem Services
PIU	Project Implementation Unit
PMU	Project Management Unit
PPE	Personal Protective Equipment
PPG	Project Preparation Grant
PSC	Project Steering Committee
PUC	Pollution Under Control Certificate
RBP	Royal Botanical Park
RCC	Reinforced Cement Concrete
RECOP	Regulation for the Environmental Clearance of Projects
RENEW	Respect, Education, Nurture and Empower Women
RGOB	Royal Government of Bhutan
RICB	Royal Insurance Corporation of Bhutan
RNR	Renewable Natural Resources
RSTA	Road Safety and Transport Authority
SEP	Stakeholder Engagement Plan
SES	Social and Environmental Screening
SES	Social and Environmental Standards
SESP	Social and Environmental Screening Procedure
SH	Sub Himalayan
SMART	Spatial Monitoring and Reporting Tool
SMP	Spoil Management Plan
SOBR	State of the Basin Report
SOP	Standard Operating Procedure
SRF	State Reserved Forest
SRFL	State Reserved Forest Land
SRM	Stakeholder Response Mechanism
TH	Tethyan Himalaya
ToR	Terms of Reference
UNDAF	United National Development Assistance Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UWICER	Ugyen Wangchuck Institute for Conservation and Environment Research
UWIFORT	Ugyen Wangchuck Institute for Forestry Research and Training
WHO	World Health Organization
WMD	Watershed Management Division

WSP	Water Safety Plan
WUA	Water User Association
WUG	Water User Group

EXECUTIVE SUMMARY

The "Advancing Climate Resilience of the Water Sector in Bhutan" project aims to improve the resilience of communities in climate-vulnerable regions by addressing water shortages and declining quality. The project will restore critical catchments, provide irrigation water for farmers, replicate existing PES schemes, and promote climate-proofing of water infrastructure using IoT and digital technologies. This will enhance livelihoods, food production, and human health, particularly for communities dependent on forest resources. The project consists of four components: water governance; nature-based solutions for sustainable watersheds; efficient water supply, distribution, and utilization; and knowledge management.

The project aims to improve water infrastructure in six gewogs in Tsirang Dzongkhag, Bhutan. It will enhance efficiency in water tapping, storage, conveyance, and distribution, addressing inefficient surface water storage and distribution. The project will also improve domestic water quality by expanding sources, storage, and treatment to meet Bhutan's Domestic Water Quality Standard and WHO guidelines.

Component 3 of the Project aims to improve water infrastructure's adaptive capacity to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment.

Under activity 3.1.3, the project involves the upgradation of the existing water supply scheme into an integrated system that will serve domestic and irrigation water from Khuchi Khola watershed. Currently, this water supply scheme supplies drinking water and dryland irrigation for Patshaling, Barshong, Mendrelgang, Ranthangling, Tsholingkhar and Kilkorthang gewogs. Features of the project will include the establishment of intake channels, collection tanks and laying pipelines between the offtake points at the Khuchi Khola source to the respective tail-end water distribution systems.

The infrastructure work involves the construction of two weirs at 2 water sources (Kuchi Khola 1 and Kuchi Khola 2) with barbed wire fencing and gate. Raw water pipelines from the 2 sources will flow into an RCC sand trap. From the sand trap a 12.7 km water pipeline will transfer water to two RCC reservoirs (250 Cum Capacity) at Dhupi top under Mendrelgang Gewog. From the Reservoir #1, drinking water will be transferred via a 4.257 km pipeline to an additional RCC (250 Cum) to Darchhangang Top under Rangthangling Gewog, from where it will be distributed to Mendrelgang, Kikorthang and Rangthangling Gewogs through four distribution pipelines ranging from 63 mm to 100 mm in diameter.

From Reservoir #2 at Dhupi Top, the water will be distributed to Barshong and Mendrelgang Gewogs through three distribution pipelines ranging from 63 mm to 100 mm in diameter.

The trench size is 1.2 m wide by 1.5 m deep for which a working corridor of 3 m is anticipated. The total water pipeline length is 40.3 km of which 1 km passes through the biological corridor, 5 km through private land and the remaining through state forest reserve land and scrub forest (34.4 km/85%). Based on the length of the water pipeline through the SRFL and BC, the corridor to be cleared for the trench is estimated at 6.36 Ha. The total area required for other infrastructure (intake area, sand trap, reservoir, break pressure tanks and take off chambers) is 0.31 hectares, resulting in a total project footprint of 6.67 Ha.

The ESIA approach includes desk review, data collection from PIU via email, data collection during field visits and consultations with relevant stakeholders. The ESIA conforms with the ESMF, the requirements as per UNDP Social and Environment Safeguards (SES) and RGOB's Environmental Assessment Act, 2000. Potential environmental and social impacts were assessed through field visits and consultations and described as per UNDP's SES. For each impact, mitigation measures are described in Chapter 8.

The project design process included field assessments and site selection in consultation with community representatives. Climate resilient designs include the construction of gabion walls upstream of intake to block debris during monsoon season; construction of retaining walls for slope stability; and the use of HDPE/DI pipes and fittings. The design also takes into consideration the topography and on moderate to steep slopes, sections of the suspended pipes will be supported with pipe support pillars and retaining walls. All bends and slopes will be protected by thrust blocks. To reduce the water pressure, minimize pipe breakage and prevent freezing during winter, the pipeline will be laid 1.2 m wide by 1.5 m deep trenches and will be back filled with the excavated muck. The intake area, sand trap, reservoir and the break pressure tanks will be secured with fencing and gate. All Water Retaining Structures/components will be constructed with reinforced cement concrete.

The project will provide drinking water for 8,117 inhabitants from 1,452 households in six gewogs (Barshong, Mendrelgang, Rangthangling, Patshaling, Tsholingkhar and Kilkhorthang) as well as two schools. It will provide additional irrigation water for 3,119.3 acres of cultivated dryland that are currently under cultivation and allow farmers to recultivate some of the fallow land (416.18 acres) in the six gewogs.

Successful interventions will yield significant socio-economic benefits to communities including safe reliable water, improved sanitation and health, and improvement in livelihood through enhanced agricultural production.

All the UNDP SES principles and standards are triggered by the project infrastructure. The extent of the impacts against each standard has been assessed and described accordingly and mitigation measures have been proposed according to the mitigation hierarchy.

Overall, the project is 'Moderate' risk, due to the nature of the infrastructure work. The potential adverse social and environmental risks and impacts are limited in scale, are largely reversible and can be identified with a reasonable degree of certainty. These impacts are readily addressed through application of recognized good international industry practice, mitigation measures and stakeholder engagement during project implementation. Mitigation measures involve conducting biodiversity assessments, preparation, implementation, and monitoring of a robust biodiversity action plan to minimize any potentially significant adverse impact and enhance biodiversity conservation including other related environment and social mitigation measures.

The water source lies in Biological Corridor 3 and 2/3s of the pipeline will also traverse state reserve forest and shrubland, 2 community forest areas (Bulkhay Community Forest in Patshaling Gewog and Thuenpa Phuensum Community Forest in Barshong Gewog). While the Forest Clearance and Clearance from the Community Forest Management Groups (CFMG) has been obtained, the project is to ensure that the CFMG members benefit by providing them with saplings or assisting them in either creating nurseries or maintaining their existing nurseries.

Through the field assessment and in consultation with the forest officer, five mammal species and 58 bird species were documented. Of the species recorded, the Golden Langur is listed as Endangered under the IUCN Red List and is listed in Schedule II of the FNCA, the Great Hornbill is listed as Vulnerable under the IUCN Red List and is listed in Schedule II of the FNCA, and the Rufous-throated Wren-babbler is listed as Near Threatened under the IUCN Red List and is listed in Schedule III of the FNCA. Four other bird species are Least Concern but included in Schedule III of the FNCA. No fish was recorded in the Khuchi Khola.

Towards the settlement, sections of the water pipeline will traverse private land for which prior clearance from the community has been obtained. The project will not acquire land, will not displace, or resettle any households and will not alter land tenure arrangements. The excavation work along the alignment will traverse 143 plots, where it is anticipated that landowners will be marginally impacted only during the 24-month construction period.

During the public consultation it has been confirmed that there are no communities in the project areas that depend largely on forestry resources as a source of livelihood. The project activities will not hamper the seasonal collection of non-timber forest products by the communities.

While contractors may prefer to employ local people for material haulage and excavation work and other manual work because they are more accustomed to the difficult terrain and are more physically able than foreign laborers, locals do not have the necessary technical skills for other work such as construction of intake channels, pipe jointing or masonry work. It is anticipated that semi-skilled and skilled workers would be sourced from outside the area.

The Contractor is to ensure worker health and safety protocols are complied with by adhering to relevant labor laws and regulations, identifying hazards, providing safe drinking water, PPE, first aid, training/awareness emergency response protocols, grievance mechanisms and ensuring compliance with the code of conduct.

During the operation phase, it is envisaged that risks related to poor drinking water quality, damage to infrastructure, damage from natural hazards and disaster, tampering and the need for accountability and appropriate water sharing management mechanisms might occur.

In preparing the ESMP, project impacts are categorized into pre-construction, construction, and operation phases. Mitigation measures were developed to reduce adverse negative effects, in consultation with UNDP, PMU, PIU and the community.

The ESMP outlines mitigating measures, responsibilities, and budget requirements to effectively manage all potential environmental and social issues likely to occur during the different phases of project implementation.

The Environmental Monitoring Plan describes the indicators for compliance monitoring along with responsibilities. The key responsibilities of the PSC, PMU, PIU, and Gewogs for the implementation of the ESMP have also been outlined.

As required under the UNDP SES, to guarantee an Accountability Mechanism for the construction activities, the Stakeholder Response Mechanism (SRM) will be ensured through the establishment of a Grievance Redress Mechanism (GRM), which is based on the UNDP guidance on Grievance Redress Mechanism and the Stakeholder Engagement Plan. The Contractor will be required to follow the Occupational Health and Safety, Labor Management Plan, Waste Management Plan and Chance Find Procedures as well. The Biodiversity Action Plan requires

the involvement of the Department of Forest, the Department of Livestock, Contractor and allocation of budget from the project to implement activities proposed.

The GRM aims to offer accessible grievance resolution procedures for project-related grievances and disputes among affected individuals, communities, and stakeholders. It follows the UNDP SES guidance on eligibility and describes the terms of reference for the GRM committees.

1. INTRODUCTION

1.1. Background

The project **"Advancing Climate Resilience of the Water Sector in Bhutan" (ACREWAS**) forms a core part of Bhutan's national plan to provide integrated water supply for four Dzongkhags in Bhutan. The project aims to enhance the resilience of communities to climate change-driven impacts on water resources and water infrastructure in some of the most climate vulnerable regions in the country. The project addresses the shortages and declining water quality, which has a direct bearing on increased vulnerabilities of livelihoods, food production and human health that depend on the renewable natural resources (RNR) sector, particularly for those communities that are dependent on forest resources. The overall objective of the project is to enhance the resilience and sustainable economic well-being of the people of Bhutan by supporting climate adaptation interventions in the water sector.

The project will:

- Restore, manage, and protect critical catchments to stabilize and enhance water yields by enhancing their resilience to extreme events and extended dry seasons.
- Provide irrigation water for farmers and support them in adopting climate resilient agricultural practices.
- Replicate existing Payment for Ecosystem Services (PES) schemes to sustain the management of critical catchments.
- Promote climate proofing of water infrastructure and remove barriers to adaptation solution using tools that leverage the Internet of Things (IoT) and digital technologies.

1.2. Project Components

The project will be implemented through four components.

- Component 1: Water governance and institutions
- Component 2: Nature-based solutions for sustainable & climate-resilient watersheds and livelihood enhancement
- Component 3: Efficient, adequate, and sustainable supply, distribution, and utilization of water
- Component 4: Knowledge management

The project targets interventions in six gewogs under Tsirang Dzongkhag. The site was selected based on a comprehensive assessment of socioeconomic and climate hazards at the Dzongkhag level as well as a Gewog level and vulnerability analysis of water resources in Bhutan including drinking water and irrigation water sources.

This component will focus on the establishment and demonstration of adequate climate-smart and efficient water infrastructure. The component will enhance efficiency in tapping at source, storage, conveyance, and distribution of domestic and irrigation water in the project Dzongkhag and address barriers related to inefficient and inadequate surface water storage and distribution. Increased frequency of landslides and mud slips has contributed to sedimentation and contamination of water sources. The component will also address challenges related to quality of domestic water by improving and expanding water sources, storage, and treatment to meet Bhutan's Domestic Water Quality Standard, 2016 and WHO guidelines for domestic water quality.

The outcome under Component 3 of the Project aims to enhance adaptive capacity of water infrastructure to climate-induced water shortages and quality deterioration through climate-proofing, private sector engagement, and technology deployment**.**

Under Output 3.1: Climate proofing measures implemented in multi-purpose storage, conveyance, and distribution network of domestic and irrigation water, the project will accrue domestic water, irrigation, and watershed benefits to 37,334 individuals (17,869 females) in the three Dzongkhags (Gasa, Punakha and Tsirang). Further, this output will enable winter cropping of 1,816 Ha of agricultural land in Tsirang, which is currently limited to cultivation during summer due to a shortage of assured irrigation water. Under the entire project, an additional 519 Ha of fallow land will be brought under sustainable cultivation, contributing to enhanced livelihood of communities through assured irrigation water. Conveyance lines will be established from off-takes in sources to users. Soil and water conservation structures will be built along the water conveyance lines and off-takes and reservoirs will be protected with walls and gabions. Extensive use of vegetative measures will be made to protect all water infrastructure[1].

Activity 3.1.3 of the ACREWAS project involves the climate proofing of integrated domestic and irrigation water supply main line for 6 gewogs in Tsirang (Patshaling, Barshong, Mendrelgang, Rangthangling, Tsholingkhar and Kilkhorthang Gewogs). The provision of the interventions, once successfully completed, will result in significant socio-economic benefits to the communities in terms of reliable water for domestic purposes as well as irrigation, allowing rural communities to improve their livelihood through enhanced agricultural production. Through the integrated scheme, communities will be rid of their water shortage problems and can avail safe drinking water and live healthier lives through the provision of adequate water for washing and sanitation by the Ministry of Infrastructure and Transport.

[1] ACREWAS Project Document

1.3. ESIA Approach and Methodology

During the project preparation phase, a detailed analysis of the project's overall social and environmental risks was conducted and presented in the UNDP Social and Environment Screening Procedure (SESP). The SESP identified 11 risks, of which 8 were scored as moderate and 3 were scored as low, resulting in an overall categorization of Moderate Risk to the project. The environmental and social safeguards screening was also carried out and an Environmental and Social Management Framework (ESMF) was prepared. The ESMF provided the framework and procedures for screening, assessing, and managing the potential social and environmental impacts of the project interventions, to ensure full compliance with UNDP SES requirements during project implementation.

The ESMF requires the project to assess the environmental and social impacts and risks through an Environment and Social Impact Assessment (ESIA) study. Based on the ESIA, the Environmental and Social Management Plan (ESMP) is to be prepared to ensure that the relevant risks and impacts identified are adequately addressed through mitigation measures and a system for monitoring these risks and impacts are established.

The ESIA has been prepared based on project documents, field investigations and stakeholder consultations to meet the requirements for environmental assessment process and documentation as per UNDP SES and RGOB's Environmental Assessment Act, 2000. The approach was outlined in the Inception Report submitted prior to commencement of the assignment.

The preparation of this report followed the subsequent stages over a period of one and half months (1st October to 15th November 2023). Details of the Stakeholder engagement has been provided in Chapter 5.

1.3.1. Desktop Research and Literature

All relevant national laws, rules, regulations, guidelines and standards and project documents were reviewed to gain a comprehensive understanding of national regulatory requirements and to formulate the Chapter pertaining to legal framework compliance requirements in terms of national and international conventions, agreements, and obligations. Gaps between national legislation and international policies of the UNDP were identified so that compliance measures for the higher standard could be incorporated. All relevant data required to compile the baseline chapters for each subproject location were reviewed (physical, ecological, economic development and socio-cultural aspects). Based on the desk review and a set of data requirements, questionnaires and topics for various stakeholder's consultations and community meetings were prepared.

Additional data was obtained through field visits, secondary data sources, verification of data in the fields and through consultations with relevant stakeholders and officials. Data collected through desktop reviews, field assessments and consultations were analyzed and verified through PIU, PMU and UNDP.

1.3.2. Analysis of Alternatives

Alternatives were considered for the project site and assessed in consultation with the Project Management Unit including the 'no action/without project scenario', from the point of view of social, environmental, and economic aspects.

1.3.3. Site Assessment and Rapid Biodiversity Surveys

To determine the environmental impacts, rapid biodiversity surveys at the water source and water pipeline alignment were conducted from 8th to 14th October 2023. The site visits were supported by the Dzongkhag and Gewog Officials and the surveyors were accompanied by Dzongkhag staff and community members knowledgeable about the project component locations.

The focus of the assessments was to determine whether the project components would impact the following: a) Protected areas, critical habitats b) Endangered, rare, threatened, or vulnerable wildlife and bird species, and c) Community Forest. The findings of the survey are incorporated into the baseline chapter on existing environmental conditions, land use, forest cover, topography, and biodiversity.

1.3.4. Stakeholder Engagement and Consultation

A consultation/stakeholder engagement plan was prepared by mapping the stakeholders (as per their interest and influence). This was prepared prior to the field visit in consultation with the PMU and UNDP. Stakeholder consultations were conducted with relevant Dzongkhag, Local Government, and communities on 11th and 12th October 2023.

Consultative meetings/discussions are detailed in Chapter 8. The consultations were supported by the Dzongkhag and Gewog Officials.

As per the ESMF, the Stakeholder Engagement Plan developed during the project's design phase will guide all actions pertaining to SES implementation. The FPIC protocol developed in the SEP has been followed. Details are covered in Annex 10.

1.3.5. Gender Action Plan

As directed in the ToR, the Gender analysis and planning process were aimed to ensure that the GAP developed for the project is mainstreamed across project implementation and in the ESMPs. The Gender assessment and planning process included the following:

- Review of the Gender Analysis and Gender Action Plan (July 2022): The Gender Analysis and Gender Action Plan developed in July 2022 was reviewed and updated based on the discussions at the project site.
- Brief Gender Analysis Report: The results of the above exercise were used to prepare a brief Gender analysis as part of the main report, including demographic profiling with Gender break-up in the project site.

- Gender Action Plan: Based on the review exercise above, the Gender Action Plan for the project site was revised keeping in view the recommendations from the Gender Analysis and Gender Action Plan Report of July 2022. The revised Gender Action Plan also addresses the compliance monitoring and report requirements as well as the capacity development needs.

1.3.6. Determining the Area Project of Influence

A project's area of influence encompasses the following according to UNDP Social and Environmental Standards 2021.

- The primary project site(s) and related facilities (intake structure, water pipelines, reservoirs, canals, disposal areas),
- Areas and communities potentially affected by cumulative impacts from the project or from other developments in the geographic area.
- Areas and communities potentially affected by induced impacts from unplanned but predictable developments or activities caused by the project, which may occur later or at a different location.

Table 1. Project Area of Influence.

Area of Influence	Description	Area
Direct Area of Influence	This Direct AoI includes the direct footprint of the Project facilities (both temporary and permanent installations and extend to a 5 m radius (land distance). For terrestrial flora, the direct impact zone is the immediate area near the project components.	Intake area at Khuchi Khola, reservoir areas at Dhupi and Darchhargang and water pipelines through 6 gewogs.
Indirect Area of Influence	For aquatic biodiversity, the area of indirect influence may extend downstream and upstream in the watershed. For mobile terrestrial fauna species or those with limited distribution, the area of influence may extend depending on the population dynamic and continuity of habitats up to 2 km.	2. Tashipang, Riserboo, Mendrelagng and Pemashong Chiwogs under Mendrelgang Gewog. 3. Neymedsa, Nyimazor, Darchhargang and Rangthaling-charingma Chiwogs under Rangthangling Gewog. 4. Barshong Toed and Gangtogkha Chiwogs under Barshong Gewog 5. Menchuna Chiwog under Kikhorthang Gewog 6. Tsholingkhar Toed and Drupchhugang Chiwogs under Tsholingkhar Gewog: 7. Pangthang and Thakorling Chiwogs under Patshaling Gewog.
Cumulative Area of Influence	Includes all project gewogs.	All project gewogs.

1.3.7. Impact assessment and preparation of the ESIA and ESMP

The ESIA includes an assessment of the direct, indirect, and cumulative environmental and social impacts as per UNDP SES, during project planning, design, construction, and operation within the project area of influence.

Based on the impact assessment, appropriate mitigation measures were determined and proposed to address the risks and impacts in accordance with the mitigation hierarchy in the ESMP. Implementation and monitoring responsibilities and capacity requirements were also identified.

The ESIA and ESMP is based on the project design and layout obtained till 30th October 2023, and may be revised subject to changes in the project design or component locations.

1.4. Report Structure

The report is structured in accordance with the inception report submitted and approved by UNDP following the suggested outline as per the targeted hybrid ESIA and ESMP format. The Project Management Unit (PMU) and Project Implementation Unit (PIU) have supported the report preparation.

2. LEGAL AND INSTITUTIONAL FRAMEWORK

2.1. National Legislation, Standards and Guidelines

This section reviews the existing legislation in Bhutan related to the environment and social context and that are relevant to the project. It examines whether the existing legal framework in Bhutan is adequate to address project impacts and fulfill requirements under the updated 2021 UNDP SES Policy.

Table 2. Relevant National Legislation.

Sector	Legislation	Requirements	Applicability to Project
Overarching	Constitution of Bhutan 2008	Article 5 of the Constitution of Bhutan is entirely devoted to the environment. It places responsibilities on every Bhutanese and on the royal government and requires the parliament to conserve the rich biodiversity of Bhutan. As per Article 1(12), all rivers, lakes, forests and mineral resources belong to the state and their use is regulated by law.	The ACREWAS sub-project will abstract water from distant water sources located in forests through pipes which will be buried. Felling of trees, soil disturbance through excavation and soil and dust pollution are the temporary, short-term impacts foreseen. As such the project will be governed by the Constitution as well as several other Acts.
Environment	● National Environment Strategy, 2020 ● Environmental Assessment Act, 2000 ● Regulation for The Environmental Clearance of Projects (RECOP), 2016 ● National Environment Protection Act, 2007 ● Bhutan Environmental Standards, 2010; and Drinking Water Quality Standards, 2016 ● Guide for Environmental Clearance Application Procedure, 2022	The National Environment strategy enshrines the concept of sustainable development. It is structured around four chapters namely water, air, life, and land. It provides a framework to monitor every sector and enhances the implementation and operationalization of the existing legislation from government to local level. The Environment Assessment Act outlines procedures for assessing the potential impact of projects on the environment and formulates policies and measures to reduce potential adverse effects on the environment. Based on the above premise, environmental clearance is required prior to the execution of any project that	The Environmental Assessment Act is applicable to this sub-project considering foreseeable impacts on the surrounding environment. The project will require an environmental clearance which will have to be updated during project implementation. The Dzongkhag Environment Committee is authorized to issue the Environmental Clearance to the Gewog, the applicant in the case of this project.

Sector	Legislation	Requirements	Applicability to Project
		may entail adverse impacts on the environment.	
Governance	• The Local Government Act of Bhutan, 2009 • Civil Liability Act, 2023	The Act delineates the roles and responsibilities of local government vis-à-vis the central government. The Civil Liability Act ensures accountability across all stakeholders.	Since its enactment, environmental conservation has been decentralized to the gewogs and municipalities to ensure activities taken up within their jurisdiction are consistent with environmental laws and policies to reduce risks to public health and contribute to local socioeconomic development. The project will be implemented in Gewogs and thus these local governments will be responsible for processing and monitoring the project.
Land	• Land Act of Bhutan, 2007 • Rules and Regulations for Lease of Government Reserved Forest Land & Government Land, 2018 • Land Exchange Rules and Regulations, 2022	The Land Act was enacted to manage, regulate and administer the ownership and use of land for the socio-economic and environmental wellbeing of the country. The Act intends to achieve this through efficient and effective land administration, security of land tenure, equal opportunity to land, facilitation of operation of land market, effective use of land resources and conservation of the ecosystem.	In this project, most of the pipeline will be aligned on government land. The structures will also be constructed on government land. However, in the case where pipes have to be aligned across private land, the local government has to seek the permission of the landowner and negotiate access across his/her plot of land to the pipeline/channel. In most cases, the owner accords consent and the pipeline/channel is aligned.
Gender Equality	• National Gender Equality Policy (NGEP), 2020 • The Domestic Violence Prevention Act of Bhutan, 2013 • Inheritance Act of 1980 • Loan Act of 1981 • The Land Act of Bhutan, 2007 • The Constitution of the Kingdom of Bhutan, 2008 • Penal Code of Bhutan, 2004 • Civil and Criminal Procedure Code of Bhutan, 2001 • Labour and Employment Act,	The National Gender Equality Policy promotes equal opportunities for women and men, boys and girls to achieve their full potential and benefit equitably from the social, economic and political developments. The Domestic Violence Prevention Act of Bhutan covers the prevention of physical, sexual, psychological, and economic and emotional violence. These are aimed at addressing domestic violence issues and ensuring the protection of victims.	Under the project, Gender analysis has been carried out and a Gender Action Plan prepared for the project which ensures that women's needs in the project have been identified and a strategy and action plan for their participation in the project prepared.

Sector	Legislation	Requirements	Applicability to Project
	2007 & Regulations on Working Conditions, 2012 • Disaster Management Act, 2013 • National Policy for Women, 2009 • National Plan of Action for Gender Equality 2019-2023 • Education Sector Plan - Bhutan Education Blueprint 2014-2024 • Strategic Framework for Gender Responsive Planning and Budgeting, 2014	The Inheritance Act guarantees equal inheritance rights to men and women. The Loan Act determines that women are eligible to possess land and collateral for getting a loan. The amended Land Act establishes that the minimum age for registering land is 18 years for both women and men. The Constitution of Bhutan includes provisions related to Gender equality and women's rights, ensuring that women have equal rights in various aspects of life. The Penal Code includes provisions related to crimes against women and girls and aims to address violence and discrimination. The Civil and Criminal Procedures contain provisions related to legal procedures for addressing Gender-based crimes. The Labor and Employment Act prohibits sexual harassment. The Regulations on Working Conditions provides for the protection of labor rights, Gender equality in the workplace, and appropriate and safe conditions at the workplace. The Disaster Management Act underlines the importance of women's participation in making decisions related to disaster management and risk reduction. The National Policy for Women outlines the	

Sector	Legislation	Requirements	Applicability to Project
		government's commitment to promote Gender equality and women's rights in Bhutan. The National Plan of Action for Gender Equality aims to advance Gender equality and the empowerment of women and is aligned with international commitments and conventions including CEDAW. The Education Sector Plan - Bhutan Education Blueprint, includes strategies for promoting Gender equality in education and ensuring that girls have equal access to education. The Strategic Framework for GRPB provides guidance to implement GRPB and identifies institutional arrangements, advocacy, awareness-raising and capacity-building, collection of sex-disaggregated data, Gender analysis of sectors, and development of Gender-sensitive indicators as main strategies.	
Vulnerable Groups	• The National Youth Policy, 2011 • The National Policy for Persons with Disabilities of Bhutan, 2019	The National Youth Policy sets out goals to provide youth with proper education and training opportunities, provide access to information in respect of employment opportunities and to other services. The National Policy for Persons with Disabilities of Bhutan ensures that the vulnerable and marginalized group enjoy the same rights and opportunities as the rest of the population and seeks to improve the lives of persons with disabilities	The Policies and Acts aim to empower persons with disabilities, mainstream disability initiatives in plans, policies and programs in all sectors, improve access to opportunities and services for persons with disabilities, improve the socio-economic condition of persons with disabilities, promote health and living of disabled persons through sports, recreation and cultural participation and to remove stigmatization and discrimination of people towards disabled persons. This project too will encourage and plan to ensure the participation of disabled persons identified during the project preparation phase in

Sector	Legislation	Requirements	Applicability to Project
			discussions and decision-making events in the course of the project implementation.
Labour and Worker Health, Safety and Management	• Labour and Employment Act, 2007 • Regulations on Working Conditions, 2022 • Regulation on Foreign Workers Management, 2022 • Regulation on Occupational Health, Safety and Welfare, 2022 • Regulation on Occupational Health and Safety for Construction Industry, 2022 • Revised National Workforce Wage Rate, 2015 • Guideline for the Approval, Employment, and Management of Border Town Foreign Workers (BTFW), 2022	The legislations have been enacted to govern the employment and working conditions for all persons employed and working within the Kingdom of Bhutan. The Regulation on Occupational Health, Safety and Welfare (OHSW) establishes the standards on occupational health, safety and welfare on premises, instruments, vessels, appliances, apparatus, tools, devices, electrical safety and other hazardous conditions in general. In line with this regulation, a specific Regulation on Occupational Health and Safety for Construction Industry was released for construction sites in line with the relevant provisions of the OHSW Regulation.	In the context of this project, since there will be as many as 50 workers working directly in the project, terms and conditions of their employment are governed by the provisions of this Act to ensure their wellbeing and security. Also, children according to this Act will not be employed in project activities which entail working in physical conditions and terrain as well as operating tools and implements which may pose a risk to their physical person (article 9).
Forest and Biodiversity	• Forest and Nature Conservation Act, 2023 • Forest and Nature Conservation Rules, 2000 (revised 2006, 2017) • Forest and Nature Conservation (Amendment) Rules and Regulations, 2020 • The Biodiversity Act of Bhutan, 2022 • The Biodiversity Rules and Regulations, 2023	The Act enables the DoFPS to institute mechanisms for Payment for Environmental Services, to enhance resilience against climate change impacts and for green accounting and financial plough back to enhance conservation and sustainable management of forest resources. Sections 51-56 covers the establishment and management of Community Forest. The Act prohibits the killing, capture, collection, cultivation or trade in any wild flora and fauna, unless with a permit.	As the project site is located on State Reserve Forest land, a Forestry Clearance is mandatory according to the Forest and Nature Conservation Act 2023 and Forest and Nature Conservation Rules 2023. Section 55 enables the Government to implement and execute any developmental activity of national importance in the Community Forest. In such a case, fair compensation as determined by the DoFPS must be paid to the Community Forest Management Group.
Climate Change	• Climate Change Policy of the Kingdom of Bhutan, 2020	There are four policy objectives: Pursue carbon neutral development, build resilience to climate change, ensure means of	This project addresses the shortages and declining water quality, which has a direct bearing on increased vulnerabilities of livelihoods, food production and human health. The

Sector	Legislation	Requirements	Applicability to Project
	• Regulation on Substances that Deplete the Ozone Layer and Hydrofluorocarbons, 2021	implementation and effective and coordinated actions. The policy provides strategic guidance to ensure that Bhutan remains carbon neutral, adapts to climate change in an efficient and effective manner through adequate means of implementation (finance, technology, capacity building and awareness) and integration into relevant plans and policies.	project endeavors to climate proof the domestic water supply for as many as 10,000 beneficiaries.
Water	• Water Act of Bhutan, 2011 • Water Regulation of Bhutan, 2014 • Water Policy, 2007 • Bhutan Drinking Water Quality Standard, 2016	According to the Water Act of Bhutan, every individual must have access to safe, affordable, and sufficient water for basic human needs. The Act prioritizes water use as follows: 1) water for domestic and sanitation 2) water for agriculture 3) water for energy 4) water for industry 5) water for tourism and recreation and 6) water for other uses.	The project must ensure that at least 30% of the water flow is maintained as the minimum environmental flow to sustain livelihoods and ecosystems downstream. The Act also restricts the discharge of effluent directly or indirectly to any water resource. The project must ensure that as per the Bhutan Drinking Water Quality Standard, 2016, the acceptable parameters for drinking water is maintained through periodic water testing.
Waste	• Waste Prevention and Management Act of Bhutan, 2009 • Waste Prevention and Management Regulation, 2012 (Amended 2016) • National Waste Management strategy, 2019	The Act covers all forms of waste whether solid, liquid, or gaseous, hazardous, or non-hazardous, organic, or inorganic and from all sources. It covers the collection, storage, transportation, disposal, as well as import and export of waste in Bhutan. It promotes reducing the generation of waste at source and promotes waste segregation, reuse, recycling, and environmentally sound disposal.	During the project, the Contractor must be responsible for dealing with the domestic waste generated by the 30 to 50 workers employed by him. He will also have to find suitable ways to dispose of construction waste.
Road Safety	• Road Act, 2013 • Road Safety and Transport Regulations, 2021	The Road Act mandates all vehicles to be registered and drivers to have the appropriate driving license. Vehicular emission levels in the country must follow National standards and are to be carried out annually	As vehicles will be transporting construction materials and workers to the project site, the following provisions apply: • Barricade and install suitable warning signs and lights if the construction work is being carried

Sector	Legislation	Requirements	Applicability to Project
		for private vehicles after which a "Pollution under Control Certificate" (PUC) is issued.	out or is located where any vehicular traffic may cause danger to workers. ● Vehicles must comply with the requirements of the Road Safety and Transport Authority and the driver must hold a valid driving license.
Disaster and Natural Hazards	Disaster Management Act of Bhutan, 2013	This act mandates the establishment and strengthening of institutional capacity for disaster management, mainstreaming disaster risk reduction, and ensuring an integrated and coordinated disaster management through community participation. The national Disaster Management authority headed by the Prime Minister is the apex body for disaster management.	Under Section 24 and 25, every Dzongkhag must constitute a Dzongkhag Disaster Management Committee, headed by the Dzongdag (District Head), which (Sections 30, 31) is responsible for coordinating and managing all disaster management operations under the direction and supervision of the National Disaster Management Authority.
Heritage	Movable Cultural Property Act of Bhutan 2005	The Movable Cultural Property Act of Bhutan pertains to the conservation and protection of movable cultural property owned by government, community, or private individuals. "Valuable Cultural Properties" refers to all items with artistic, historical, cultural, religious, social, archaeological, or technical value and interest and have been grouped into 13 categories.	The Act requires the discovery of valuable cultural properties discovered from below ground during the construction of roads, buildings or any other related works, this discovery be immediately reported to the Department of Culture through the concerned Dzongkhag.

2.2. National standards

The National Drinking Water Quality Standards, 2016 and the Bhutan Environmental Standards, 2020, sets the minimum standards for ambient air quality, noise, vehicle emissions and sewerage effluents, among others. The relevant standards are summarized in the tables below.

Table 3. Ambient Air Quality Standards.

Parameter	**Averaging Period***	**Bhutan's Ambient Air Quality Standard, 2020**** ($\mu g/m^3$)		
		Industrial Area	Mixed Area*	Sensitive Area**
TSP	24-hour	500	200	100
	Annual	360	140	70
$PM_{2.5}$	24-hour	60	60	60
	1-year	40	40	40
PM_{10}	24-hour	200	100	75
	Annual	120	60	50
SO_2	24-hour	120	80	30
	Annual	80	60	15
	10-minute	-	-	-
NO_2	24-hour	120	80	30
	Annual	80	60	15
	1-hour	-	-	-
CO	8-hour	5,000	2,000	1,000
	1-hour	10,000	4,000	2,000
	15-minute	-		
Ozone	8-hour	100	100	100
Ozone	1-hour	180	180	180

* Mixed Area means area where residential, commercial or both activities take place.
** Sensitive Area means area where sensitive targets are in place like hospitals, schools, sensitive ecosystems.

Table 4. Noise Level Standards.

Receptor/ Source	**National Noise Standard Guidelines, 2012*** (dB)	
	Day*	**Night****
Industrial area	75	65
Mixed area	65	55
Sensitive area	55	45

* Day time is from 0600 hours to 2200 hours (human activities).
** Nighttime is from 2200 hours to 0600 hours (no human activities).

Table 5. Effluent Standards.

Parameters	Unit	NEC Standards, mg/l [a]
Biochemical Oxygen Demand	mg/l	30.0
Total Suspended Solids	mg/l	100
Fecal Coliform	CFU/100ml	1,000
pH	pH scale	6.5 - 9.0
Chemical Oxygen Demand	mg/l	125

Source: Environmental Standards, NEC 2020

[a] Standards for Sewage Treatment Plant Effluent

Table 6. National Drinking Water Quality Standards, 2016.

Group	National Drinking Water Quality Standards, 2016* (for Urban Drinking Water Supply)		
	Parameter	Unit	Max. Concentration Limits
Physical	Turbidity	NTU	5
	pH		6.5 - 8.5
	Color (TCU)	Hazen Unit	15
	Taste and Odor		Non- objectionable
Chemical	Iron	mg/l	0.3
	Manganese	mg/l	0.4
	Arsenic	mg/l	0.01
	Fluoride^	mg/l	1.5
	Lead	mg/l	0.01
	Nitrate	mg/l	50
	Calcium	mg/l	75
	Mercury	mg/l	0.006
	Residual Chlorine	mg/l	0.2 - 0.5
	Sulphate	mg/l	250
Microbiological	E-coli	CFU/100ml	0

Table 7.Motor Vehicle Emission Standards.

Fuel Type	Vehicle registered prior to Jan 1, 2005	Vehicle registered after Jan 1, 2005	Vehicle registered prior to Jan 1, 2021	Vehicle registered after Jan 1, 2021 (Approval type: Euro 6/BS VI)
Petrol (%CO)	4.5%	4.0%	4.0%	0.5%
Diesel (%HSU)	75%	70%	70%	50%

Table 8. Vehicular Noise Level Limits.

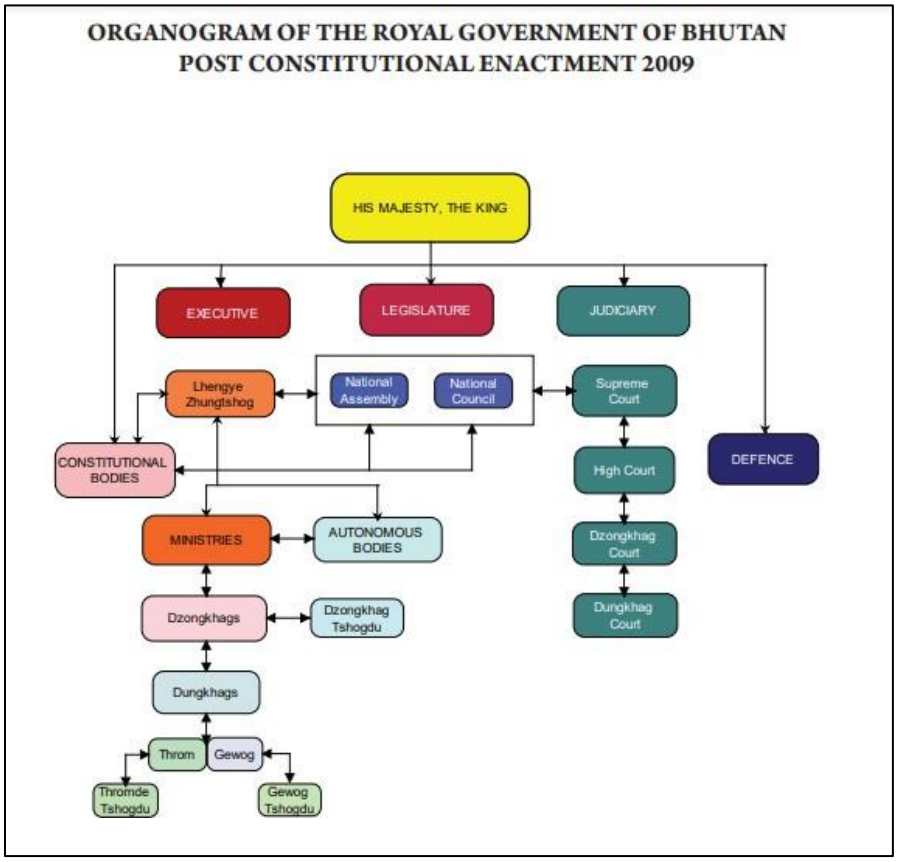
Sl. #	Type of Vehicle	Noise level limits dB(A)[2]
	Two-Wheeler	
1.1	Displacement up to 80cc	75
1.2	Displacement more than 80cc but up to 175cc	77
1.3	Displacement more than 175cc	80
2	Vehicles used for carriage of passengers and capable of having not more than nine seats including the driver's seat	74
3	Vehicles used for carriage of passengers and capable of having more than nine seats, including the driver's seat and a maximum gross vehicle weight (GVW) of more than 3.5 tonnes	
3.1	With engine power less than 150 KW	78
3.2	With engine power more than 150 KW	80
4	Vehicles used for carriage of passengers and capable of having more than nine seats, including the driver's seat: vehicles used for carriage goods	
4.1	With maximum GVW not exceeding 2 tonnes	76
4.2	With maximum GVW greater than 3 tonnes but not exceeding 3.5 tonnes	77
	Vehicles used for carriage of transport of goods with a maximum GVW exceeding 3.5 tonnes	
5.1	With engine power less than 75 KW	77
5.2	With engine power more than 75 KW or above but not less than 150 kv.	78

[2] Sound pressure level (SPL)

2.3. Institutional Framework

Bhutan is a Democratic Constitutional Monarchy with three independent branches of government: Legislative, Executive, and Judiciary, with the King as Head of State, Parliament as the highest body, and the Prime Minister as the Chief Executive.

Figure 1. Organogram of the Government of Bhutan



Source: National Statistics Bureau Statistics Yearbook of Bhutan 2020

Before 2022, there were 10 Ministries. In 2022, with the new Civil Service Reform Act, the 10 ministries were reorganized with the objective of enhancing governance[3]. The Ministries are detailed in the table in Annex 10.

Local Government. There are 20 Dzongkhags4 each of which Each Dzongkhag has Dzongdag[5]/Governor supported various sector heads (education, agriculture, livestock, health, engineering, land, environment, and culture). Each Dzongkhag has a Local Government

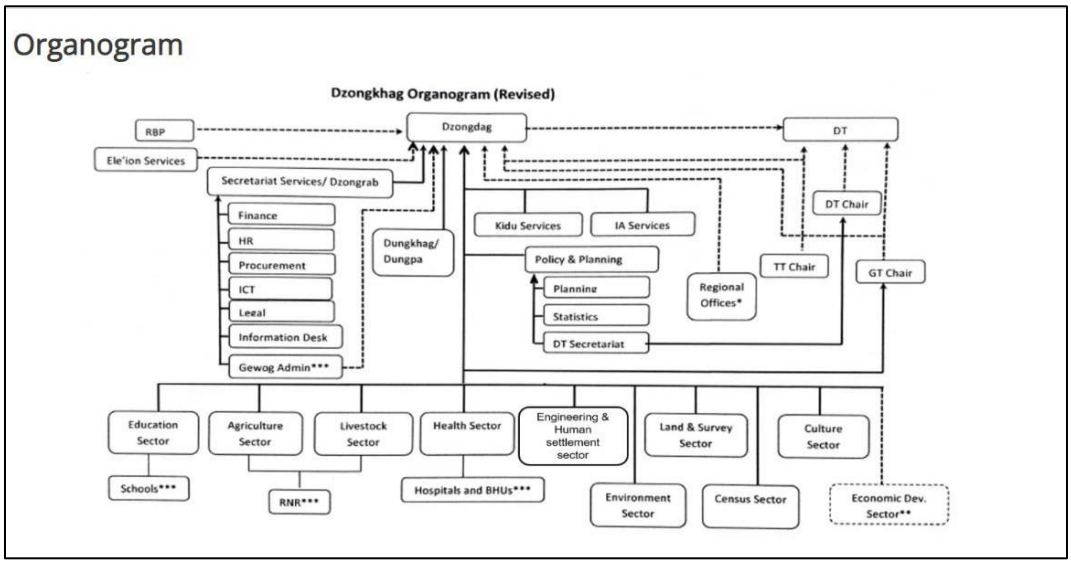
[3] Source: https://kuenselonline.com/civil-service-reform-bill-proposes-reducing-ministries-to-9

[4] 'Dzongkhag' means District

[5] 'Dzongdag' means the chief executive of a dzongkhag or any official for the time being exercising the functions of the office of dzongdag;

comprising the Dzongkhag Tshogdu[6], and Thromde Tshogde[7] and are governed by the Local Government Act 2009.

Figure 2. Dzongkhag Organogram



Source: Tsirang Dzongkhag (http://www.tsirang.gov.bt/)

Each Dzongkhag comprises of Gewogs[8], the lowest administrative structure that comprises of Chiwogs[9] and villages. Each Gewog has a Local Governments comprising the Gewog Tshogde[10] which is governed by the Local Government Act 2009.

2.4. Process of obtaining Environmental Clearance

The National Environmental Protection Act, 2007 (NEPA) established the role of the Competent Authorities within Ministries, Thromdes or Districts to screen, review and issue or deny environmental clearance, a mandatory requirement for any development activity. Approval or issuance of environmental clearance is dependent on (i) project type/activity and (ii) project location, which in turn dictates the level of environmental sensitivity and assessment required, the Competent Authority that will review, and the required clearance process to be followed.

Project Category. Proponents must check with the list of activities for which Competent Authorities can screen and issue Environmental Clearance. Projects categorized as 'Green' are exempted from the Environmental Assessment (EA) process. Projects categorized as 'Blue' require the preparation of IEE by the proponent and subsequent approval by relevant competent authority prior to issuance of an environmental clearance. Project categorized as 'Red' required an Environmental Impact Assessment (EIA) that will be reviewed and assessed by DECC.

[6] Local Government Council at the district level/District Assembly

[7] Municipal Council

[8] Block or local constituency for the election of Gup and Mangmi to the Gewog Tshogde

[9] Lowest territorial constituency consisting of a group of villages, for the election of Tshogpa to the Gewog Tshogde

[10] Local Government Council at the Gewog level/Gewog Assembly

Since the project is a 'Blue Category, a national IEE has been prepared and EC sought from the District Environment Committee, the Competent Authority for this activity.

2.5. UNDP Principles and Standards

UNDP is committed to promoting the following principles (collectively, the SES Programming Principles):

- that no one is left behind
- human rights
- Gender equality and women's empowerment
- sustainability and resilience
- and accountability of UNDP Project-level Standards

UNDP has 8 Project-level standards that are applicable to the project. The applicability of these is based on the Social and Environmental Screening Procedure (SESP) and social and environmental assessment requirements.

The implementation of the project will generate concrete positive impacts related to social and economic development, food security, and environmental sustainability. Project approaches will address structural social and economic issues in order to ensure that benefits can be extended to all targeted groups, while being sensitive to the specific needs and requirements of each group, with specific attention to Gender, vulnerable people and socio-cultural groups.

The summary of UNDP's Social and Environmental Safeguards are drawn from the SESP.

Table 9.Application of UNDP Standards.

Principles and Standards	Rating	Applicability
Principle 2: Human rights	Moderate	The project has identified vulnerable populations and socio-cultural groups who could be left out of the benefits of the project. During the community consultations, people from all socio-cultural groups in the project areas were adequately consulted in participatory consultative sessions.
Principle 3: Gender equality and women's empowerment	Moderate	The strategic needs of men and women was examined through a Gender analysis conducted by the Gender expert and Gender Action Plan (GAP) prepared during the Targeted Assessment. The GAP reinforces the Project's efforts in enhancing women's empowerment and Gender equity by mainstreaming concerns through the project activities. Furthermore, the project is designed to be Gender responsive by focusing on interventions such as encouraging women participation and capacity building in natural resource and water management committees. The project will also ensure that gendered indicators and transformative results are monitored, and sex-disaggregated data maintained.
Principle 4: Sustainability & Resilience	Moderate	Waste from construction such as cement bags, pipe pieces, broken concrete etc. will be generated as will household waste from worker camps which are non-hazardous. Such waste may enter into water bodies. If there are natural hazards, structures constructed under the project could be washed away if project infrastructure is not designed well or executed as per design or if not protected. This could lead to failure of the system to tap and deliver water to consumers. Failure of structures could result in water leakage from pipes and tanks leading to soil erosion, flooding and landslides.
Principle 5: Accountability	Moderate	The project will support the strengthening of water governance and coordination system by supporting the establishment of river basin and district level water management committees with clearly defined roles and responsibilities and linkages to enhance larger system accountability, to ensure that users are equally accountable.
Standard 1: Biodiversity Conservation and Sustainable Natural Resource Management	Moderate	Applies as the project sites are in modified, natural, and possibly critical habitats and is dependent on the ecosystem services and includes agricultural production and livestock farming. The project follows FPIC principles throughout the process of implementation and ensures in-depth engagement with stakeholders for inclusive planning and design of the interventions.
Standard 2: Climate Change and Disaster Risks	Moderate	Despite climate proofing of infrastructure as measures to prepare for any untoward climatic events, infrastructure developed under the project can be damaged by natural calamities which may occur such as episodes of excessive rain which could trigger floods and landslides. Further, nature-based interventions like spring revival, watershed improvements which will be instituted by the project can be affected by droughts or excessive rain. Impact of climate change and disaster risks to the project infrastructures will be managed and mitigated by incorporating climate-resilient design features. All pressurized pipes to be used for water conveyance will be properly buried beneath the ground to prevent external damages and ensure durability.

Principles and Standards	Rating	Applicability
Standard 3: Community Health, Safety and Security	Moderate	This standard is applicable as the project activities would entail increase of health and safety concerns amongst the communities wherein active construction activities would be undertaken including an increase of diseases with an inflow of migrant workers to the project area and the accidental collapse or failure of project structural elements.
Standard 4: Cultural Heritage	Low	This standard is applicable as the project will entail excavation work. Soil will be excavated for trenches to lay pipes. Even though no physical and tangible structure of cultural significance will be affected due to the project activities, nevertheless, the excavation works associated with the project might lead to 'chance find'. In an unlikely event of chance finding, where artifacts are unearthed, procedures for chance finds will be duly followed.
Standard 5: Displacement and Resettlement	Moderate	Verified during field consultation there is not going to be any eviction of people, impacts on or changes to land tenure arrangements, however, economic displacement during the construction phase is possible, but the PIU has assured minimal or no economic displacement will be ensured keeping in mind plantation/harvesting seasons to avoid disruption to their work/livelihood.
Standard 6: Indigenous Peoples	Low	In Bhutan, the concept of 'indigenous peoples' is not used but people are differentiated as 'socio-cultural groups'. Since development needs are articulated at village level and all households are fully involved in the development process during prioritization of development needs and activities and implementation. Members of all socio-cultural groups are hence included in all phases of development and also receive equal access and benefits to the outputs of development programmes.
Standard 7: Labour and Working Conditions	Moderate	Workers may also experience occupational health and safety issues at work if contractors do not provide appropriate living accommodation facilities or necessary safety equipment. Contractors may employ children and women at site and women may be paid less than their male counterparts. Recruited workers may spread communicable diseases. Workplace concerns, conflicts, and inaccessibility to internal grievance redress mechanisms by the workers may lead to discontent among workers. Due to these aspects, this Standard is applicable to the Project.
Standard 8: Pollution Prevention and Resource Efficiency	Moderate	Construction activities and excavation works require both construction materials, water, and electricity and will generate both construction and household waste and pollutants from vehicles, machines, and construction worker camps, thus, triggering the applicability of this standard.

2.6. Comparison of UNDP Principles and National Legislations

The UNDP Principles and Standards as prepared in the ESMF was reviewed and the gaps are summarized below.

Table 10.Gap Assessment Between National Legislation and UNDP Principles and Standards.

	UNDP SES	Requirement	National Law	Requirement	Comparative Analysis
Overall Principle 1	Leave No One Behind	As an overarching programming principle, leaving no one behind requires UNDP to prioritize its programmatic interventions to address the situation of those most marginalized, discriminated and excluded, and to empower them as active agents of the development process.	• Constitution of the Kingdom of Bhutan 2008	The State shall endeavor to create a civil society free of oppression, discrimination and violence, based on the rule of law, protection of human rights and dignity, and to ensure the fundamental rights and freedoms of the people.	UNDP's Overall Principle 1 on Leave No One Behind discusses five factors of discrimination, geography, vulnerability to shocks, governance and socio-economic status that needs to be attained when applying this Principle in projects. The principle's broad approach of providing intersection of factors and reinforcing the ethos of inclusiveness Is to be adopted throughout the project life cycle.
Principle 2	Human Rights	UNDP recognizes the centrality of human rights to sustainable development, poverty alleviation and ensuring fair distribution of development opportunities and benefits, and is committed to supporting "universal respect for, and observance of, human rights and fundamental freedoms for all".	• Constitution of the Kingdom of Bhutan 2008 • Land Act 2007 • Childcare & Protection Act of Bhutan 2013 • National Policy for Persons with Disabilities 2019	The State shall endeavor to create a civil society free of oppression, discrimination and violence, based on the rule of law, protection of human rights and dignity, and to ensure the fundamental rights and freedoms of the people.	The Constitution of Bhutan guarantees equal and effective protection of the law and protection against discrimination on grounds of race, sex, language, religion, politics, or other status. The standard planning processes of needs assessment, design of projects and implementation are applied uniformly across the country. All people irrespective of status or vulnerability therefore benefit

					equitably from development. UNDP Principle 2 ensures that the projects undertaken by them recognizes the centrality of human rights through fair distribution of development opportunities and benefits. UNDP seeks to support governments to adhere to their human rights obligations and empower individuals and groups, particularly the most marginalized, to realize their rights and to ensure that they fully participate throughout UNDP's programming cycle through the application of this Principle. Thus, this Principle will be adopted throughout the Project life cycle.
Principle 3	Gender Equality & Women's Empowerment	The promotion of Gender equality and the empowerment of women are central to the mandate of UNDP and intrinsic to its human rights-based approach to development programming.	● Constitution of the Kingdom of Bhutan 2008 ● National Gender Equality Policy 2020	The State shall endeavor to create a civil society free of oppression, discrimination and violence, based on the rule of law, protection of human rights and dignity, and to ensure the fundamental rights and freedoms of the people.	UNDP's Principle 3 ensures that the projects undertaken by them promote gender equality and empowerment of women. UNDP strengthens interventions tackling structural changes and removes the institutional, societal, political and legal barriers to accelerate gender equality and women's empowerment. They strive to close the gender gap by focusing on

					empowering and creating agency for women and men. UNDP's requirement for Principle 3 provides a broader approach to gender equality and women's empowerment than the Constitution and National Gender Equality Policy. Thus, the Principle 3 will be adopted for its specific requirement of meaningful participation of women in project decision-making and engagement in paid work during the construction work.
Principle 4	Sustainability and Resilience	Sustainable management, protection, conservation, maintenance and rehabilitation of natural habitats and their associated biodiversity and ecosystem functions are fundamental to UNDP's efforts to develop and implement sustainable development pathways.	• Constitution of the Kingdom of Bhutan 2008 • Regulation for Environmental Clearance of projects 2016 • Bhutan Environmental Standards 2010 (revised 2020) • National Environmental Protection Act 2007 • Water Act and the Water Regulation of Bhutan 2014 • Waste Prevention and Management Act of Bhutan 2009 • Bhutan Environmental Standards 2010 (revised 2020)	The National Environment strategy enshrines the concept of sustainable development. It is structured around four chapters namely water, air, life, and land. The Environment Assessment Act outlines procedures for assessing the potential impact of projects on the environment and formulates policies and measures to reduce potential adverse effects on the environment. Based on the above premise, environmental clearance is required prior to the execution of any project that may entail adverse impacts on the environment.	Legislation is backed up with adequate personnel at all levels for impact assessment and regulation. Project will capitalize on the environmental staff in the districts as well as support from engineers, foresters etc. for environmental protection activities of impacts emanating from the project. UNDP Principle 4 strengthes the resilience of societies to the impact of shocks, disasters, conflict and emergency situations, and the sustainable management, conservation and rehabilitation of natural habitats (and their associated biodiversity and

					ecosystem functions) are fundamental to Organisation's efforts to develop and implement sustainable development pathways. UNDP seeks to address poverty and inequality and to reduce vulnerabilities while maintaining and enhancing natural capital. Through the broad approach advocated by the Principle, this Principle ensures that through the Project resilience of communities and nation can be built. This includes identifying and addressing the interconnections among issues related to the environment, human rights, conflict, crises and vulnerability, where relevant and providing appropriate mitigation measures to mitigate the risks identified.
Principle 5	Accountability	UNDP does not support activities that do not comply with national law and obligations under international law, whichever is the higher standard (hereinafter "Applicable Law").	● Constitution of the Kingdom of Bhutan 2008 ● Audit Act of Bhutan 2018 ● Audit Rules and Regulations 2020	The Audit Act guides practices to institute transparency, integrity, and accountability in the government as well as other stakeholder organizations.	. Public consultation needs to be carried out as per Article 16 of the Environment Assessment (EA) Act 2000, and Section 41 of the Regulation for Environmental Clearance of Projects (RECOP) 2016. This ensures Transparency and accountability during

					project formulation and implementation. UNDP Principle 5 promotes accountability to programme and project stakeholders by (i) enabling active local community engagement and participation in decision-making, particularly those at risk of being left behind; (ii) ensuring transparency of programming interventions through provision of timely, accessible and functional information regarding supported activities, including on potential environmental and social risks and impacts and management measures; (iii) ensuring stakeholders can communicate their concerns and have access to rights-compatible complaints redress processes and mechanisms; and (iv) ensuring effective monitoring–and where appropriate, participatory monitoring with stakeholders–and reporting on implementation of social and environmental risk management measures. Hence, through the application of this Principle, accountability and

					transparency can be ensured throughout the Project life cycle.
Standard 1	Biodiversity Conservation and Sustainable Natural Resource Management	UNDP seeks to maintain and enhance the goods and services provided by biodiversity and ecosystems in order to secure livelihoods, food, water and health, enhance resilience, conserve threatened species and their habitats, and increase carbon storage and sequestration.	Forest and Nature Conservation Act (FNCA) 1995	If the project site is located on State Reserve Forest land, a Forestry Clearance is mandatory according to the Forest and Nature Conservation Act 2023 and Forest and Nature Conservation Rules 2023.	UNDP SES Standard 1 ensures that the assessment of the impacts on the natural resources, biodiversity and ecosystem services should be undertaken as an integral part of ESIA studies so that adequate mitigation measures can be adopted to offset the risks and impacts identified. The National Act and subsequent regulations require clearances for activities on SRFL, dictate compensation for community forest groups, and limit activities on protected areas. However, it is restrictive to ensure that an assessment of the impacts on the natural resources, biodiversity and ecosystem services should be undertaken as an integral part of ESIA study. Hence, Standard 1 of UNDP SES shall be complied with to ensure that that the risks and impacts related to the project activities are

					identified so that appropriate mitigation measures are developed.
Standard 2	Climate Change Mitigation and Disaster risks	UNDP supports countries to integrate low-emission, climate-resilient objectives into national and sectoral development plans, identify priority mitigation and adaptation measures, implement measures to reduce vulnerability and increase adaptive capacity and resilience.	• National Environmental Protection Act 2007 • Climate Change Policy of the Kingdom of Bhutan 2020 (Final Draft) • Disaster Management Act of Bhutan 2013 • Disaster Management Rules & Regulations 2014	All government agencies and institutions must assess priorities and needs on mitigation and adaptation and integrate such actions within their plans and programs.	The policy provides strategic guidance to ensure that Bhutan remains carbon neutral, adapts to climate change in an efficient and effective manner through adequate means of implementation (finance, technology, capacity building and awareness) and integration into relevant plans and policies. The Disaster Management Act, 2013 provides for establishment and strengthening of institutional capacity for disaster management, mainstreaming of disaster risk reduction, and for integrated and coordinated disaster management focusing on community participation. It underlines the importance of women's participation in making decisions related to disaster management and risk reduction. UNDP Standard 2 ensures that projects undertaken by them are sensitive to climate change and disaster risks in order to strengthen resilience and to achieve sustainable

					development outcomes. Through this Standard, the mitigation measures and Management Plans as developed as part of the ESMP, has ensured that risks and impact envisaged are duly well taken care of during the project cycle.
Standard 3	Community Health, Safety and Security	This Standard addresses the need to avoid or minimize the risks and impacts to community health, safety and security that may arise from project-related activities, with particular attention given to disadvantaged and marginalized groups.	• Constitution of the Kingdom of Bhutan 2008 • Local Government Act of Bhutan 2009 • Road Safety and Transport Act 1999 • Road Safety and Transport Regulations 2021	Article 5(2) of the Constitution of Bhutan requires the Government to ensure a safe and healthy environment. The Local Government Act of Bhutan (2009) promotes decentralization and devolution of power and authority to the Local Governments that represent the interests of local communities.	Section 213 requires that all national agencies conduct periodic consultations with the Local Government before any project or program is implemented in their area, as well as involve Local Governments both in the planning and implementation of national projects. UNDP SES Standard 3 ensures that the projects avoid or minimize the exacerbation of impacts caused by natural or man-made hazards, such as landslides or floods that could result from land use changes due to the project activities. In addition, UNDP also ensures that the projects are gender-sensitive and considers the risks on the health and

					safety of the women and children. Standard 3 shall be complied with to ensure that the community health & safety aspects are evaluated and mitigated during the various phases of the project cycle. UNDP ensures that the projects avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour. The contractor will adhere to the national regulation while setting up the sanitary facilities for workers at the construction area. In addition, the proponent will also comply with UNDP Standard 3 requirements to ensure appropriate services for the labourers are provided to minimize the impact generated by the facilities on the environment.
Standard 4	Cultural Heritage	UNDP recognizes the importance of Cultural Heritage for current and future generations and seeks to ensure that Cultural Heritage is protected during development activities. UNDP seeks to ensure equal participation, access and contribution of women and men in protecting and	● The Movable Cultural Property Act of Bhutan 2005	The Movable Cultural Property Act of Bhutan 2005 pertains to the conservation and protection of movable cultural property owned by government, community, or private individuals. Such property is	Section 54 requires the discovery of valuable cultural properties discovered from below ground during the construction of roads, buildings, or any other related works, to be immediately reported to the Department of

		sharing the benefits of Cultural Heritage.		required to be listed and registered with photographs and maintained by the Lhakhang and the concerned Dzongkhag.	Culture through the concerned Dzongkhag. Standard 4 ensures that all cultural heritage is protected from damage, inappropriate alteration, disruption, removal or misuse; preservation and safeguards are maintained, promotion of equitable sharing of benefits from the use of Cultural Heritage is assured and meaningful consultation with stakeholders regarding preservation, protection, utilization and management of Cultural Heritage is promoted. The Act is restrictive in its approach of considering international conventions and regulations in terms of conserving and preserving cultural heritage. Standard 4 is to be complied with as it ensures that the Cultural Heritage is preserved, protected, and promoted in project activities in a manner consistent with UNESCO Cultural Heritage conventions or any other national or international legal

					instruments that might have a bearing on the use of Cultural Heritage.
Standard 5	Displacement & Resettlement	UNDP will seek to avoid physical and economic displacement in its Projects. In exceptional circumstances and where avoidance is not possible, displacement may occur only with full justification, appropriate forms of legal protection and compensation, and according to acceptable requirements.	• Constitution of the Kingdom of Bhutan 2008 • Land Act 2007 • Land Compensations Rates 2017	There is a gap in national legislation.	Avoidance of land is not mentioned specifically in the provision of the Land Act. The government uses the Property Assessment & Valuation Agency Land and Cash Crop Compensation Rates 2017 to calculate the compensation, which is way below the market rates for land, and therefore is not a 'fair' compensation which the Land Act purports to provide to affected people. Affected people who must relocate currently do so incurring substantial costs at their own expenses since relocation and transitional costs are not included in current procedures. People whose land and property are affected will face adverse economic impacts as well since land or property may be used for cultivation and houses for rental or running businesses. Since the laws do not aid economic displacement, the laws do not specifically target vulnerable persons which may lead to social exclusion. The current laws do not provide for this

					so the project must ensure meaningful consultations and institution of a grievance redressal mechanism for the project. UNDP Standard 5 ensures that physical displacement (i.e. relocation or loss of shelter), whether full or partial and permanent or temporary, or economic and occupational displacement (i.e. loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land or resource acquisition or restrictions on land use or access to resources (including through project externalities such as pollution and impacts to biodiversity or ecosystem services) that people depend on for physical, economic, social, cultural, or spiritual well-being are well compensated if impacted. The tenant of this Standard is to be adhered to in the Project as it ensures that all affected population are to be adequately compensated if affected and stakeholder engagement and grievance mechanism are to be

					implemented so that accountability and transparency can be attained throughout the Project life cycle.
Standard 6	Indigenous Peoples	The promotion and protection of the rights of indigenous peoples, especially concerning their lands, territories, traditional livelihoods, cultures, and resources, are necessary to achieve UNDP's goals of advancing human rights, respecting indigenous peoples identities and improving their well-being.	● Constitution of the Kingdom of Bhutan 2008	There is a gap in national legislation.	Standard 6 ensures that projects undertaken by UNDP avoids adverse impacts on the rights of indigenous peoples, their lands, territories, resources, to mitigate and remedy residual impacts, and to ensure provision of just and equitable benefits and opportunities for indigenous peoples in a culturally appropriate manner. While the Constitution is broad, the UNDP's Standard 6 is specific as it ensures the full and effective participation of indigenous peoples, with the objective of securing their free, prior, and informed consent (FPIC) where their rights, lands, territories, resources, traditional livelihoods may be affected.
Standard 7	Labour and Working Conditions	Project activities seek to enhance employment promotion benefits, development outcomes and sustainability by ensuring sound worker-management relationships and cooperation in their design and implementation.	● Labor & Employment Act 2007 ● Regulation on Occupational Health, Safety and Welfare (OHSW) 2012	Labor administration in the country is guided by the Labor and Employment Act of the Kingdom of Bhutan, 2007 and its regulations such as the Regulations on	Standard 7 shall be complied with to ensure that workers' health & safety aspects are evaluated and mitigated during the

				Working Conditions, 2022; Regulation on Foreign Workers Management, 2022; Regulation on Occupational Health, Safety and Welfare, 2022; and the Regulation on Occupational Health and Safety for Construction Industry, 2022.	various phases of the project cycle. Structural elements shall be designed and constructed by competent professionals and certified or approved by the competent authorities or professionals. For projects with structural elements or components whose failure or malfunction may threaten the safety of the communities, UNDP ensures that the plans for project supervision, operation, and maintenance are developed and monitored. Independent expertise on the verification of design, construction, and operational procedures is used and periodic safety inspections are carried out. This shall be complied with by the contractor for all structures that would be constructed as part of the project. Standard 7 of UNDP shall be complied with by the contractor to ensure that the laborers are provided with safe and healthy working

					environment, considering the risks inherent to the particular sector (including gender bias) and specific classes of hazards in the work areas as the national regulation is restrictive in terms of encompassing risks inherent to various sectors and classes of hazards in the work areas. Standard 7 of UNDP shall be complied with as it ensures that the steps are taken to prevent accidents, injury, and disease arising from, associated with, or occurring during work and ensures the application of preventive and protective measures consistent with the international good practice, as reflected in internationally recognized standards such as the World Bank Group's (WBG) Environmental, Health, and Safety (EHS) Guidelines. The national regulation is restrictive in its scope and fails to adopt measures consistent with the

					international good practice and WBG's EHS guidelines. Thus, UNDP Standard 7 is to be complied with as it ensures compliance with national labor and occupational health and safety laws, with obligations under the international law, and consistency with the principles and standards embodied in the International Labor Organization's (ILO) fundamental conventions.
Standard 8	Pollution Prevention and Resource Efficiency	Pollution prevention and resource efficiency are core elements of a sustainable development agenda and UNDP Projects must meet good international practice in this regard.	● National Sanitation and Hygiene Policy, 2020 ● Waste Prevention and Management Act, 2009	Requires compliance with National Environmental Standards, 2020 that covers compliance with the maximum permissible levels for air, drinking water quality, noise.	UNDP's Standard 8 ensures that the projects avoid the release of pollutants, and when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants into the air, water, and land due to routine, non-routine, and accidental circumstances. The Waste Prevention and Management Act is restrictive as it discusses how effluents should be treated. Standard 8 shall be complied with as it considers

					minimization and/or control mechanism in terms of controlling the intensity and mass flow of the pollutant's release. UNDP Standard 8 ensures that pollution prevention and control technologies and practices, consistent with international good practice, are applied during the project life cycle. The technologies and practices applied shall be tailored to the hazards and risks associated with the nature of the project.

2.7. International Conventions

The table below summarizes relevant international treaties and conventions ratified by Bhutan.

Table 11.Relevant International Agreements and Conventions.

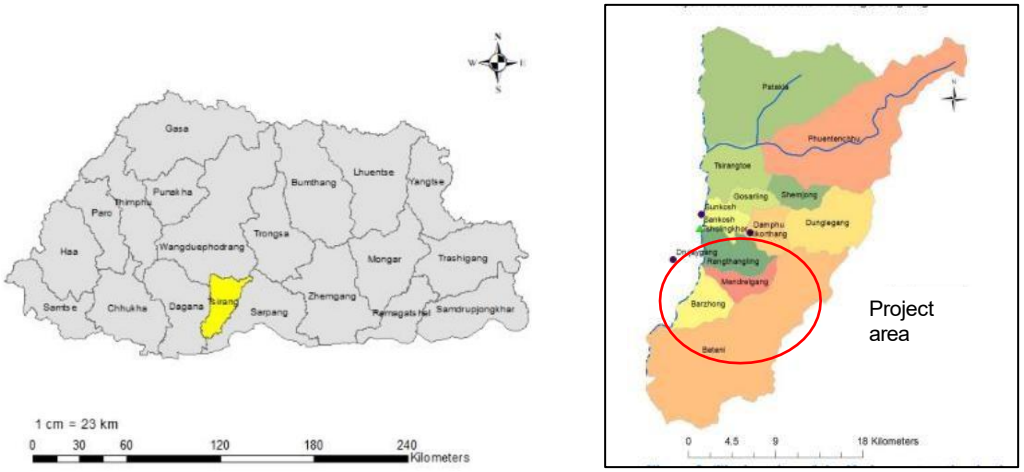
#	International Agreements/Conventions	Accessed/ Ratified/became a party or member
1	Convention on Biological Diversity	1995
2	Vienna Convention for the Protection of the Ozone Layer	2004
3	The Montreal Protocol on Substances that Deplete the Ozone Layer	2004
4	The Kigali Amendment to the Montreal Protocol	2019
5	United Nations Framework Convention on Climate Change (UNFCCC)	1995
6	Kyoto Protocol	2002
7	Paris Agreement	2017
8	The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	2002
9	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	2002
10	RAMSAR Convention on Wetlands	2012
11	Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris 1972)	2001
12	The Cartagena Protocol on Biosafety to the UN Convention on Biological Diversity	2002
13	International Plant Protection Convention	1994
14	FAO International Treaty on Plant Genetic Resources for Food and Agriculture	2003
15	Convention on safeguarding of the Intangible Cultural Heritage	2005
16	International Convention on the Elimination of All Forms of Racial Discrimination (ICERD)	2005
17	Convention on the Elimination of All Forms of Discrimination against Women (CEDAW)	1981
18	Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT)	1990
19	Convention on the Rights of Persons with Disabilities (CRPD)	2005
20	Optional protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict (OP - CRC - AC)	2009
21	Optional Protocol to the Convention on the Rights of the Child and the sale of children, child prostitution and child pornography (OP - CRC - SC)	2009

3. DESCRIPTION OF THE PROJECT

3.1. Project location

The project is in Tsirang Dzongkhag in south central Bhutan. The project infrastructure is in Patshaling, Mendrelgang, Barshong, Kikorthang, Tsholingkhar and Rangthangling Gewogs.

Map 1.. Map showing Tsirang Dzongkhag and Project Gewogs



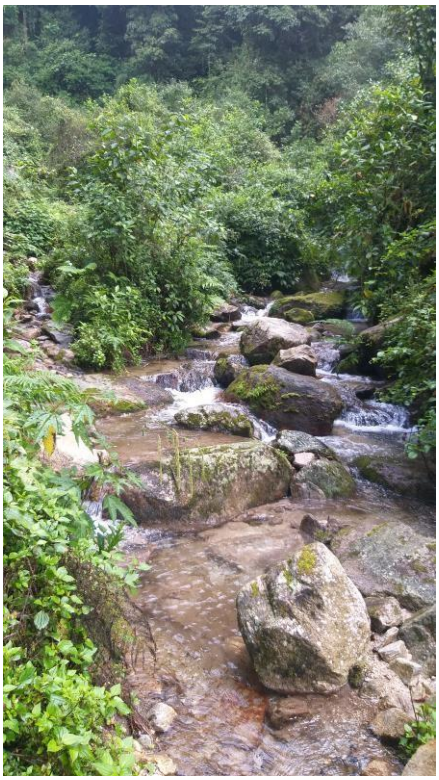
Source. MoIT [11]

3.2. Description of project components

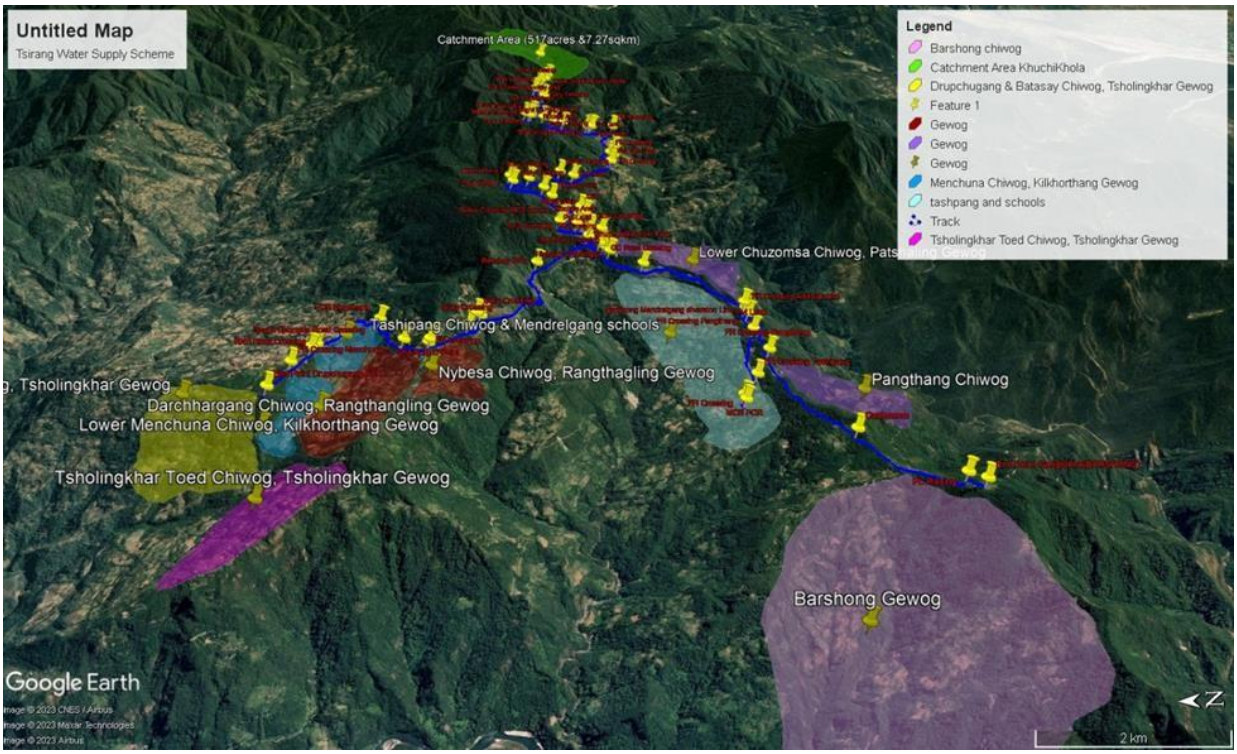
The project involves the upgradation of the existing water supply scheme into an integrated system that will serve domestic and irrigation water from Khuchi Khola watershed. Currently, this water supply scheme supplies drinking water and dryland irrigation for Patshaling, Barshong, Mendrelgang, Ranthangling, Tsholingkhar and Kilkorthang Gewogs. Features of the project will include the establishment of intake channels, collection tanks and laying pipelines between the offtake points at the Khuchi Khola source to the respective tail-end water distribution systems.

[11] MOIT. Flood Hazard Assessment for Tsirang Dzongkhag. Retrieved from https://www.moit.gov.bt/wp-content/uploads/2019/02/Tsirang_Version2_KK.pdf

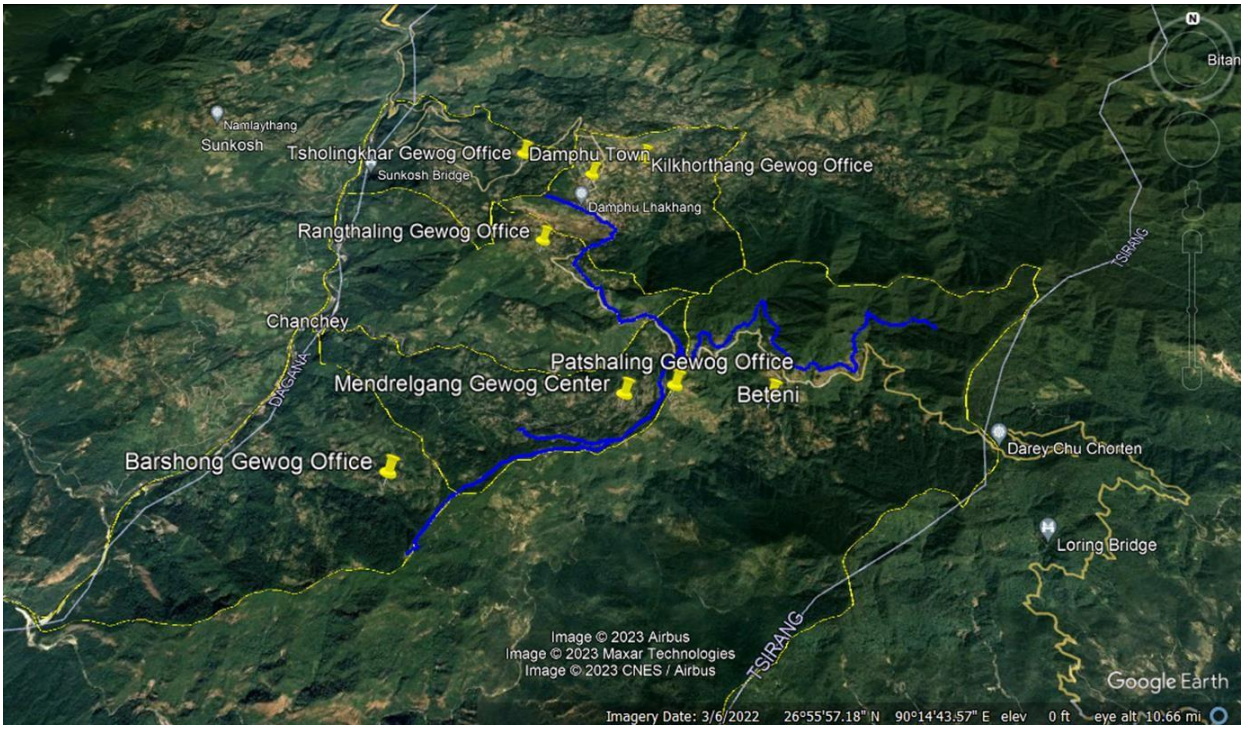
Photo 1. The Kuchikola sources



Map 2. Mendrelgang Scheme



Map 3. Map Showing Pipeline Alignment



Currently, some of the water from the Khuchi Khola stream is being tapped to supply drinking water to the Tsirang town and its surrounding area (38.833.12 lps). This is based on the projected demand for drinking and irrigation as per the population projection of 30 years. The current water discharge measurements were carried out on the 16 of November 2023. The total discharge for two streams was 194.22 lps yield and during the lean season is 81.91 lps of which the project will abstract 58 lps and an additional 38.84 lps is currently tapped for the municipality. This leaves 97.38lps which is more than the required 30% mandated e-flow rate as shown in Table 12. During the construction, the contractor will abstract water for construction activities and for domestic purposes, but these will be temporary lasting only until the completion of civil works at the water source. Depending on the location of worker camps, the contractor will extract water from the nearest stream.

Water availability in rivers and streams in Bhutan is highly variable depending on the season and lowest during the lean season. There is a risk that future climate changes may potentially impact the water source resulting in variability in stream flows in the future, which could potentially affect the water source sustainability.

Table 12. Water Discharge Rates, Projected Demand and Resulting Downstream Flow.

Supply/Demand	**Volume (lps)**
Source discharge flow	**194.22**
Integrated water requirement	**58**
Current water abstraction - Municipality	**38.84**
Balance downstream flow (%)	**97.38**
Required Eflow	**58.266**

Note: The discharge was measured below the confluence of the two streams and the data is therefore the combined discharge for both water sources.

The design period for the water transmission and distribution is 30 years while for the BPTs & Reservoirs is 15 years each. The project duration is projected at 24 months and the project cost is estimated at Nu. 139,716,000.00. The description and specification of the infrastructure works is summarized in Table 13 and the locations are illustrated in subsequent figures.

The infrastructure work involves the construction of weirs at 2 water sources (Kuchi Khola 1 and Kuchi Khola 2) with barbed wire fencing and gate. Raw water pipelines from the 2 sources will flow into an RCC sand trap. From the sand trap a 12.7 km water pipeline will transfer water to two RCC reservoirs (250 Cum Capacity) at Dhupi top under Mendrelgang Gewog. From the Reservoir #1, drinking water will be transferred via a 4.257 km pipeline to an additional RCC (250 Cum) to Darchhangang Top under Rangthangling Gewog, from where it will be distributed to Mendrelgang, Kikorthang and Rangthangling Gewogs through four distribution pipelines ranging from 63 mm to 100 mm in diameter.

From Reservoir #2 at Dhupi Top, the water will be distributed to Barshong and Mendrelgang Gewogs through three distribution pipelines ranging from 63 mm to 100 mm in diameter.

Photo 2. Proposed Reservoir location at Dhupi Top

Photo 3. Existing reservoir at Darchagang Top

Photo 4. Existing reservoir at Tashipang

The trench size is 1.2 m wide by 1.5 m deep for which a working corridor of 3 m is anticipated. The total water pipeline length is 40.3 km of which 1 km passes through the biological corridor, 5 km through private land and the remaining through state forest reserve land and scrub forest (34.4 km/85%). Based on the length of the water pipeline through the SRFL and BC, the corridor to be cleared for the trench is estimated at 6.36 Ha. The total area required for other infrastructure (intake area, sand trap, reservoir, break pressure tanks and take off chambers) is 0.31 hectares, resulting in a total project footprint of 6.67 Ha.

Most of the pipelines will be buried underground but in landslide prone areas and stream crossings the pipeline will be installed above the ground. In some areas, suspended pipes will be supported with pipe support pillars and all bends and slopes will be protected by thrust blocks. All structures will be made of Reinforced Cement concrete. On steep cliffs and in inaccessible areas, controlled blasting will be carried out to create space to create the transport corridor and install the support pillars.

All the major infrastructure components such as the reservoir tanks are in SRFL. No land or households will be acquired, and no household will be dislocated or resettled by the project and there will be no changes to land tenure arrangements. The trench (1.2 m wide by 1.5 m deep) for the distribution pipeline for laying of pipes will be excavated and will traverse private cultivated land. Depending on how long these trenches are left open and the length of the trench through individual property, vegetable and crop production will be marginally affected during the construction period, resulting in minor reduction of income or food insecurity and minimal impact

on the affected population dependent on their farm harvest. The pipeline alignment will traverse 143 such private plots[12].

During the construction, the contractor will abstract water for construction activities and for domestic purposes, but these will be temporary lasting only until the completion of civil works at the water source. Depending on the location of worker camps, the contractor will extract water from the nearest stream. At the source, there is no provision for electricity, so the contractor will either use solar lamps or a generator, but in other locations closer to the settlements, the contractor will tap electricity from the existing powerlines with the approval of the Bhutan Power Corporation.

It is estimated that at least 20-30 workers will be at the project site, at any given time. The contractor may opt to construct one worker camp or a few of them at various sites to carry out works simultaneously on State Forest Reserve Land, or in the settlement areas, especially for laying of distribution pipelines. The contractor may also choose to rent local houses depending on availability and proximity to the project site.

Other parallel activities.

The project will implement soil conservation and erosion control structures along water conveyance lines, protective walls around water off takes and fencing and vegetative/bio-engineering measures around reservoirs under Component 2 of the project. Participatory water resource workshops will be conducted to develop watershed development plans for implementation by local institutions and Dzongkhag Water Master Plans for the project Dzongkhags and River Basin Management Plan for Punatsangchhu river basin. This will facilitate the adoption of integrated approaches to water resource governance and management and enable water security and disaster and climate change resilience at both Dzongkhag and basin levels.

To improve resilience, sustainability, and quality of water service delivery, the project will strengthen water governance, and provide institutional and community level capacity for climate-smart water and watershed management. These activities will be conducted in parallel to the construction work so that by the time the infrastructure is completed, the required governance, institutional arrangements, and capacities to take over the operation and management of the scheme is in place.

[12] Information from Land Record Office, Tsirang Dzongkhag

Table 13. Details of the Project Components.

Component	Infrastructure	Size	Location
Drinking water and Irrigation supply distribution system	Construction of Intake Channel, Collection Tank, Gabion Wall and Barbed wire fencing with gate	15.00 m x 10.00 m & RCC Intake Structure - Type - I - 7.0 m x 2.5m (Catchment Area - 100 m x 20 m). Type - II - 4.6 m x 1.7 m (Area - 12 m x 12 m).	at the Khuchi Khola Source in Patshaling Gewog.
	Construction of RCC Sand Trap with barbed wire fencing and gate.	7.10 m x 3.5 m (Area - 12 m x 12 m).	
Irrigation distribution system	Providing & Laying of Raw Water Main Pipeline.	Length -13.8 km, Pipe Materials: 200 mm dia. DI pipes & fittings	from the Source to proposed Reservoir Area at Dhupi Top in Mendrelgang Gewog.
	2 Nos. RCC Main Reservoir using DI Pipe & Fittings	Reservoirs -250 Cum Capacity each DI Pipe	
	Barbed Wire Fencing and Gate	Gate- 20 m x 20 m	
Drinking water	Providing & Laying of Water Supply Main Pipeline-	Length - 4.26 km. Length- 154 m, Pipe Materials: 150 mm and 80 mm dia. DI pipes & fittings	from the Proposed Reservoirs at Dhupi Top to Y - Point of Rangthangling, Tsholingkhar, Kikhorthang Gewogs & then to Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kikhorthang Gewog.
	Construction of 1 No. RCC Break Pressure Tank using GI Pipes & Fittings	BPT - 5 cum GI Pipes and fittings 10.10 m diameter. (Area- 20 m x 20 m)	
	Construction of 1 No. RCC Main Reservoir using DI Pipe & Fittings with Barbed Wire Fencing and Gate - (20m x 20m)	Reservoir -250 Cum capacity Barbed Wire Fencing and Gate - (Area 20 m x 20 m)	Reservoir Area at Darchhargang Top under Rangthangling Gewog.
	Providing & Laying of Distribution Main Pipeline	Length - 2.94 km; 90 mm dia. HDPE & GI Pipes with Fittings	from the proposed Service Reservoirs at Dhupi to Existing FCRs of Lower Chumzomsa & Pangthang Chiwogs under Patshaling Gewog.
		Length-8.38 km; 63 mm dia. HDPE & GI Pipes with Fittings	from the proposed Service Reservoirs at Dhupi to Existing FCR of Barshong Gewog.
		Length-5.18 km; 90 mm dia. HDPE & GI Pipes with Fittings.	from the proposed Service Reservoirs at Dhupi to Existing FCRs of Mendrelgang High School and Primary School.
		Length - 2.95 km; 63 mm dia. HDPE & GI Pipes with Fittings	from the proposed Service Reservoirs at Dhupi to Existing FCRs of Trashipang Chiwog under Mendrelgang Gewog.

Component	Infrastructure	Size	Location
		Length- 1.28 km; 50 mm dia. GI Pipes with Fittings	from the Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kilkhorthang to the existing FCR (for Upper Menchuna) below IB Guest House.
		Length - 3.97 km; 100 mm dia. DI Pipes with Fittings.	from the Y-Point of Drugchugang, Tsholingkhar and Menchuna, Kilkhorthang to the proposed FCR (for Drugchugang, Batasay & Lower Menchuna) below VVIP Guest House.

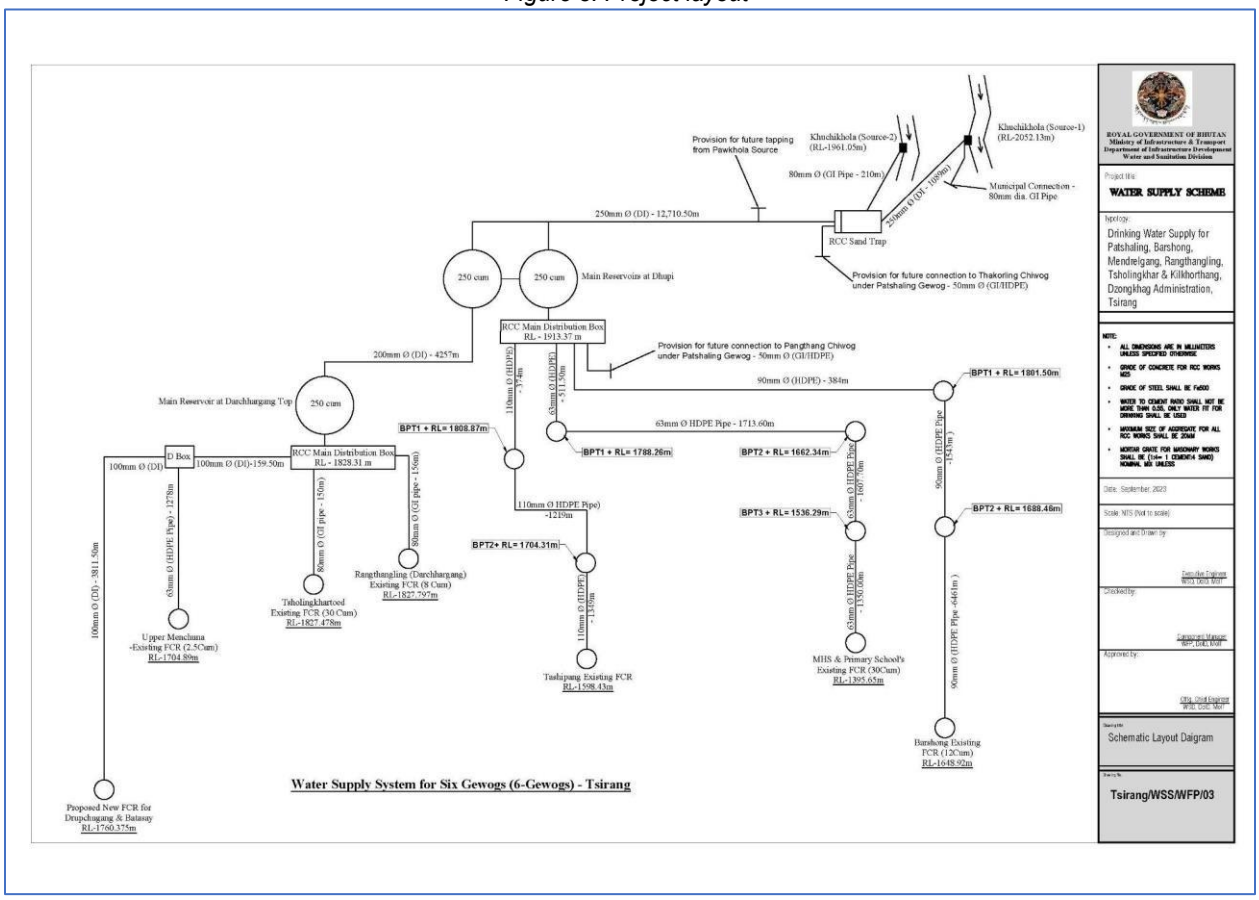
All Water Retaining Structures/components are to be RCC structure except the ancillary units.

Climate resilient components incorporated:
Intake, Collection Tank, Sand Trap, Break Pressure Tank, Reservoir & Pipeline:

- Reinforced Cement Concrete (RCC) water intake, Sand Trap, Break Pressure Tanks (BPTs) and RCC Service Reservoirs
- Gabion Walls proposed upstream of intake to block debris during monsoon seasons
- Retaining Walls are proposed to retain the Structures.
- HDPE/DI Pipes and fitting
- Trenching depth proposed1.5 m to avoid pipe breakage and to protect from freezing during winters
- Suspended pipes to be supported with pipe support pillars
- All bends and slopes should be protected by thrust blocks

The figure below depicts the layout of the project components.

Figure 3. Project layout



3.3. Project Beneficiaries

The project will benefit the following chiwogs in six gewogs directly in terms of drinking water and irrigation.

- Mendrelgang Gewog: Tashipang, Riserboo, Mendrelagng and Pemashong Chiwogs
- Rangthangling Gewog: Neymedsa, Nyimazor, Darchhargang and Rangthagling-charingma Chiwogs
- Barshong Gewog: Barshong Toed and Gangtogkha Chiwogs
- Kikhorthang Gewog: Menchuna Chiwog
- Tsholingkhar Gewog: Tsholingkhar Toed and Drupchhugang Chiwogs

- Patshaling Gewog: Pangthang Chiwog

The project is estimated to benefit 8,117 persons from 1,452 households in six gewogs (Barshong, Mendrelgang, Rangthangling, Patshaling, Tsholingkhar and Kilkhorthang).

Table 14. Project Beneficiaries.

Name of Gewog	Name of Chiwog	Households	Population	Male	Female
Tsholingkhar	Tsholingkhar Toed	169	1,293	588	705
	Drubchhugang	185	740	315	425
Rangthangling	Darchhargang Chiwog	360	850	405	445
	Neymedsa	85	300	140	160
Kilkhorthang	Kilkhorthang	93	580	300	280
Patshaling	Pangthang	65	772	376	346
Mendrelgang	Tashipang	67	508	251	257
	Pemashong	81	635	328	307
	Riserboo	126	935	455	480
	Mendrelgang	62	397	206	191
	Dzamlingzor	53	414	208	206
Barshong	Barshong Toed	40	313	159	154
	Gangtogkha	56	330	167	163
	Toedsang (B-Gairigaun)	10	50	27	23
		1,452	**8,117**	**3,925**	**4,142**

1,164 students and 110 teaching and support staff in two schools, Mendrelgang Primary School and Mendrelgang Secondary Schools will also benefit from assured water for drinking and washing purposes.

Table 15.. Students and Staff of the 2 Schools.

School	Male	Female	Total
Mendrelgang Primary School			
Boarders	56	76	132
Day students	120	116	236
Teaching staff	16	7	23
Support staff	6	5	11
Total	**198**	**204**	**402**
Mendrelgang Central School	**Male**	**Female**	**Total**
Boarders	300	320	620
Day students	84	92	176
Teaching staff	35	14	49
Support staff	17	10	27
Total	**436**	**436**	**872**
Grand total	**634**	**640**	**1274**

The project will provide additional water for 3119.3 acres of dryland that are currently under cultivation. With the additional water, farmers will undertake double cropping or plant winter crops on 416.18 acres of fallow land.

Table 16..Details on Dryland Currently Under Cultivation and Fallow Land That Can be Brought Under Cultivation.

#	Gewog	Cultivated (acres)	Fallow (acres)
1	Mendrelgang	734.58	55.08
2	Tsholingkhar	844.60	61.7
3	Kikorthang	523.93	78.4
4	Rangthangling	285.00	72
5	Barshong	533.90	38.14
6	Patshaling (Pangthang Chiwog)	197.29	110.86
	Total area	**3119.3**	**416.18**

In addition, with the access to assured irrigation water, farmers are likely to recultivate some of the fallow land (416.18 acres) in six gewogs.

3.4. Project Cost and Schedule

The project cost is estimated at Nu. 139,716,000.00. The project is planned to be constructed in early 2024 and completed within a period of 24 months with an operation and maintenance (O&M) period of one year (2024-2026).

With the climate-proofing technology the infrastructure lifespan is estimated at 70 years. This projection includes 5 years of the implementation period (including the construction period). Project's benefits will start from the third year.

4. BASELINE INFORMATION

4.1. Physical Environment

4.1.1. Location

Tsirang Dzongkhag (district) sits at an average altitude between 500 to 1900 masl. and a total area of 639 sq. km. located in the southern part of Bhutan. The district is the smallest by area size among the 20 districts in the country. Tsirang shares its borders with Wangduephodrang to the north, Dagana to the West and Sarpang to the south and the east[13].

Map 4. Map of Bhutan with Project Dzongkhag

Source: Ministry of Foreign Affairs, RGOB[14]

There are a total of 12 Gewogs (Blocks) namely – Barshong, Doonglagang, Gosarling, Kilkhorthang, Mendrelgang, Patshaling, Phuentenchu, Rangthaling, Semjong, Sergithang, Tsholingkhar and Tsirang Toed. The Gewogs are further sub-divided into 60 Chiwogs (5 in each Gewog) comprising of 101 villages in total[15].

The main administrative center is Damphu town which is located approximately 172 km [16] southeast of Thimphu and 93 km from Gelephu town in the south.

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[13] RGOB, Dzongkhag Administration, Tsirang http://www.tsirang.gov.bt/embedded-files/tsirang-glance

[14] Ministry of Foreign Affairs. https://www.mfa.gov.bt/bhutan-at-glance/

[15] RGOB, Dzongkhag Administration, Tsirang http://www.tsirang.gov.bt/embedded-files/tsirang-glance

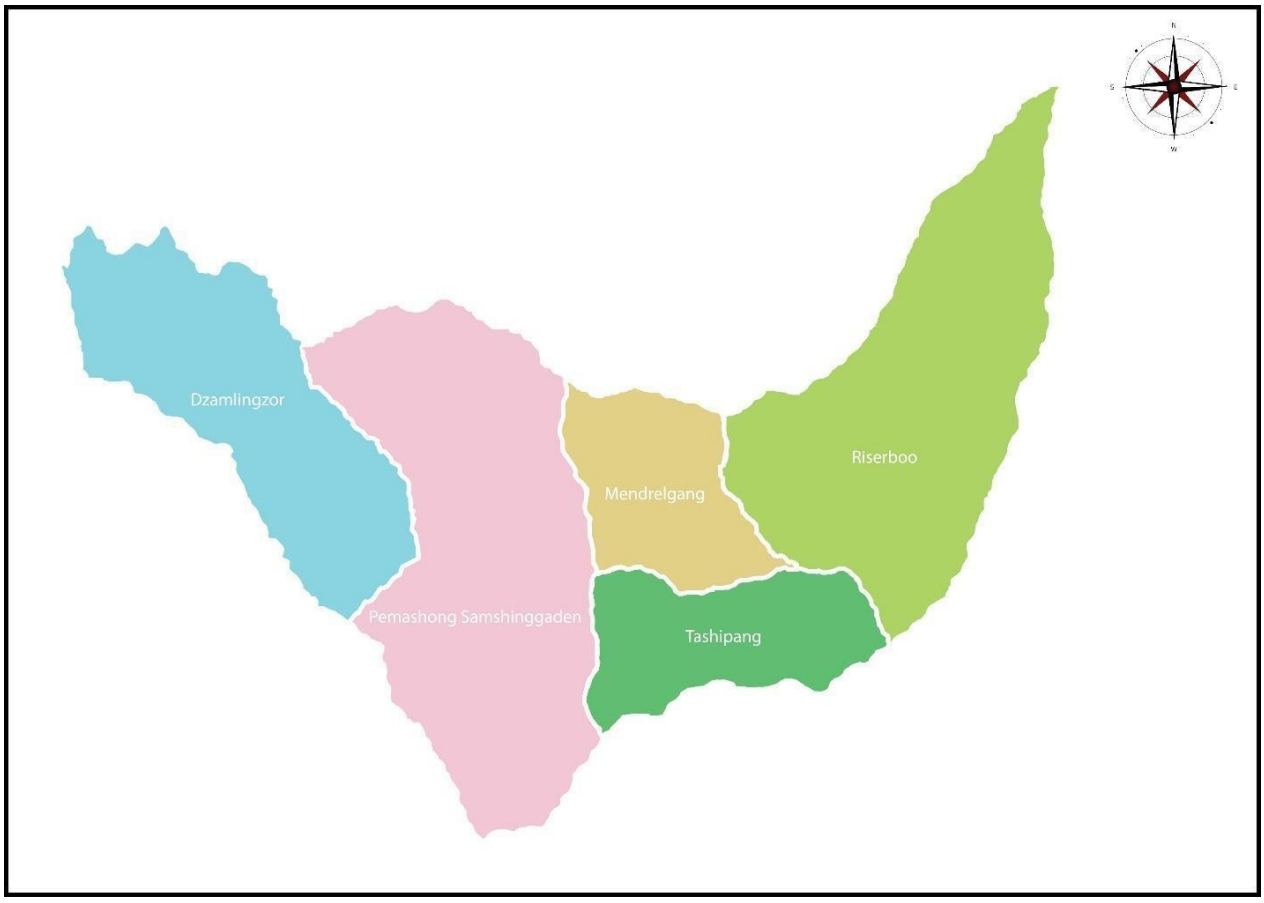
[16] BCTA 2022. Road map of Bhutan. Retrieved from bcta.gov.bt

Mendrelgang, Barshong, Kilkhorthang, Patshaling, Rangthangling and Tsholingkhar are within the scope of this project.

Mendrelgang Gewog[17]: Previously referred to as Lami Dara, Mendrelgang Gewog shares its borders with Rangthangling to the north, Barshong to the west and Patshaling to the east. The Gewog is spread over an area of 15.50 sq. km. and sits at an altitude of 700 to 1400 masl.

The Gewog has a total of five Chiwogs (sub-blocks) and 376 households, with the Gewog Center located 18 km from the Dzongkhag Headquarters in Damphu.

Map 5. Map showing Mendrelgang Gewog (including its 5 Chiwogs)



Source: Map Prepared Based on Tsirang Dzongkhag Website, RGOB

Barshong Gewog[18]: The endonym for Barshong is Gairi Gaon and the gewog lies in the western parts of Tsirang spread over an area of 21.2 sq. km. at an altitude of 700 to 1500 masl. It shares its borders with Mendrelgang to the north, Patshaling to the south and Dagana Dzongkhag to the west.

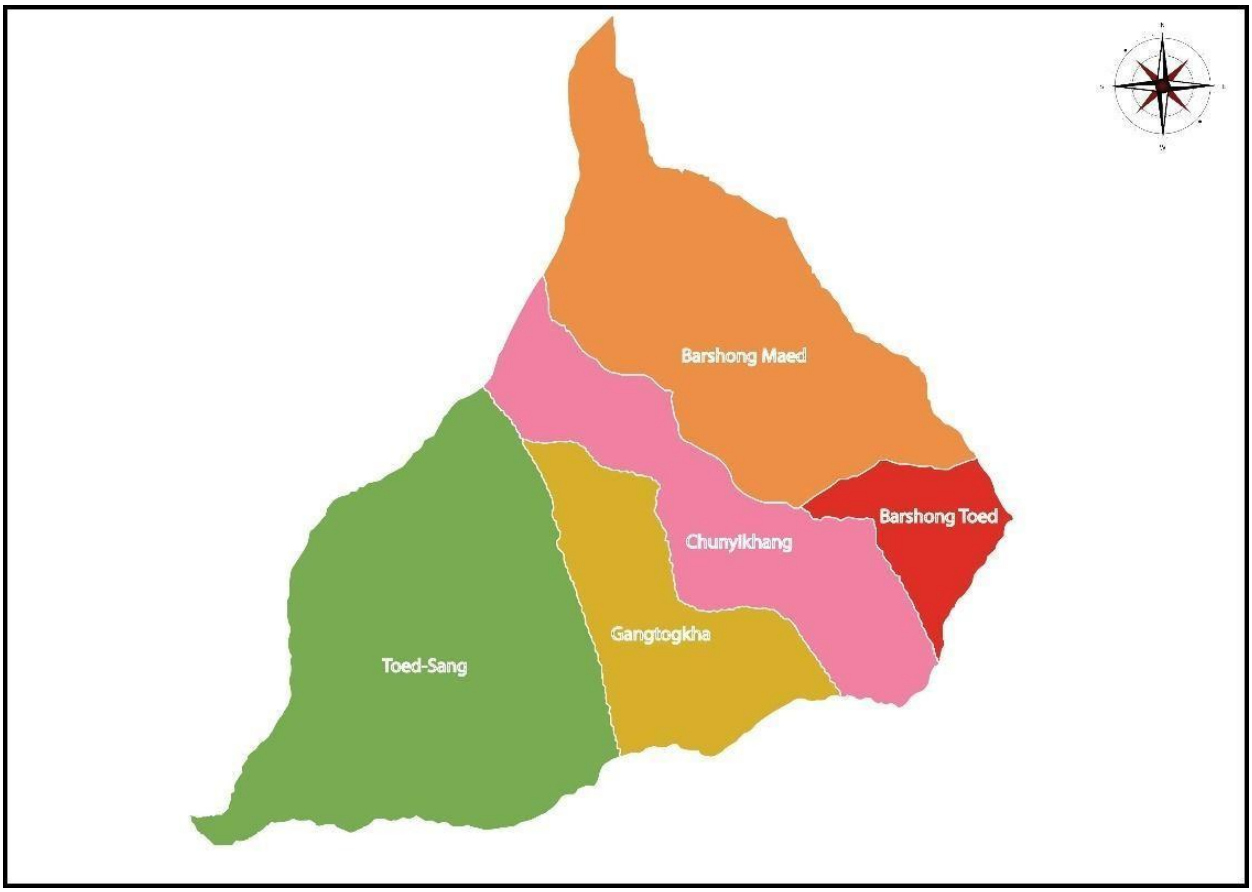
[17] Tsirang Dzongkhag Website, Mendrelgang Gewog http://www.tsirang.gov.bt/gewogs/mendrelgang

[18] Tsirang Dzongkhag Website, Barshong Gewog http://www.tsirang.gov.bt/gewogs/barshong

There are 5 Chiwogs in Barshong – specifically, Barshong Toed (upper), Barshong Maed (lower), Gangtogkha, Chunyikhang and Toed-sang. These Chiwogs comprise 9 villages and 330 households with a population density of 112.4 per sq. km.

Barshong Gewog Center is located in Barshong Toed (upper) along with the RNR center.

Map 6. Map showing Barshong Gewog (including its Chiwogs)



Source: Map Prepared Based on Tsirang Dzongkhag Website, RGOB

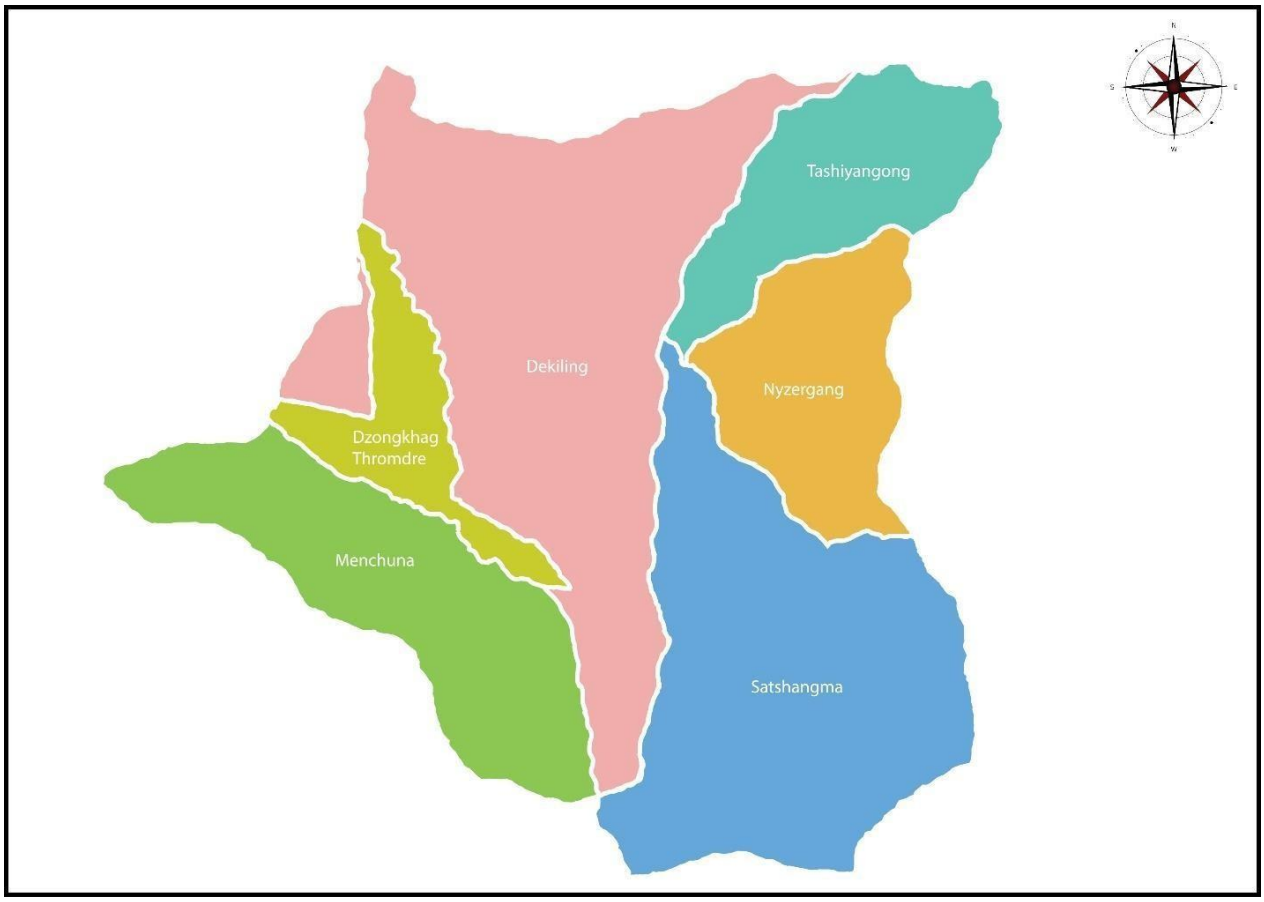
Kilkhorthang Gewog[19]: Centrally located, Kilhorthang Gewog is relatively smaller in area size (17.80 sq. km). Among the 12 Gewogs in Tsirang, Kilkhorthang is the most developed in terms of infrastructure and commercial growth. Based on the data retrieved, the Gewog also has maximum data available for relevant and regular updates and numbers in the district (as evident in the progressive sections).

The altitude of Kilkhorthang varies from 900 to 1600 masl. There are 5 Chiwogs – specifically, Dekiling, Satshangma, Nyzergang, Tashiyangong and Menchuna and 8 villages – namely, Lower Bockrey, Upper Bockrey, Methun, Sherpa Gawn, Batasey, Tashiyangong, Satshnagma and Nyzergang. The Gewog Tshogdue (GT) comprises 7 GT members, the Gup (Head of Block), 5

[19] Tshirang Dzongkhag Website, Kilkhorthang Gewog http://www.tsirang.gov.bt/gewogs/kilkhorthang

Tshogpas and the Mangmi (Community Representative). There are 479 households and 5 polling stations in Kilkhorthang.

Map 7. Map showing Kikorthang Gewog (including its Chiwogs)



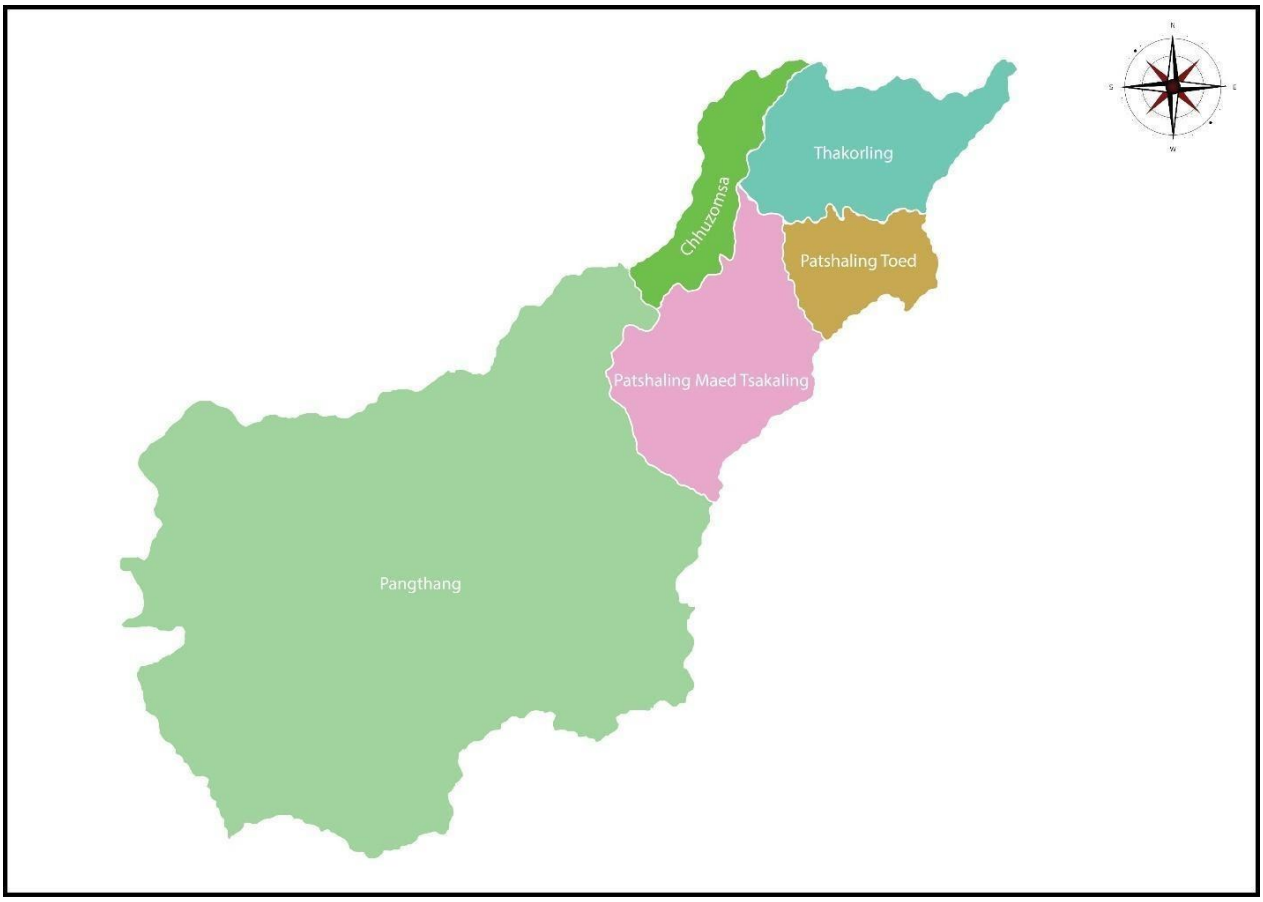
Source: Map Prepared Based on Tsirang Dzongkhag Website, RGOB

Patshaling Gewog[20]: The largest Gewog by size in Tsirang, Patshaling (Beteni) lies to the southernmost part of the district. The Gewog shares its borders with Dunglegang and Kilkhorthang Gewogs to the north, Mendrelgang Gewog, Barshong Gewog and Dagana district to the west and Sarpang district to the south.

The total area of Patshaling measures 170.9 sq. km. over an altitude of 600 to 1900 masl. The Gewog's total population is 2,505 inhabitants spread across its five Chiwogs – Patshaling Toed (upper), Patshaling Maed (lower), Thakorling, Chhuzomsa and Pangthang. In respect to its area size, Patshaling Gewog has the lowest population density of 14.6 sq. km. compared to the rest of the gewogs in Tsirang.

[20] Tshirang Dzongkhag Website, Patshaling Gewog http://www.tsirang.gov.bt/gewogs/patshaling

Map 8. Map showing Patshaling Gewog (including its Chiwogs)



Source: Map Prepared Based on Tsirang Dzongkhag Website, RGOB

Rangthangling Gewog[21]: With the endonym "Chaunetai", Rangthangling Gewog derives its name from the shape of its boundaries that resemble a conventional stone grinder. The significance, as described in the Dzongkhang website, is related to the stone grinding equipment used by Lhotsampas to grind maize (one of the major crops cultivated in the area).

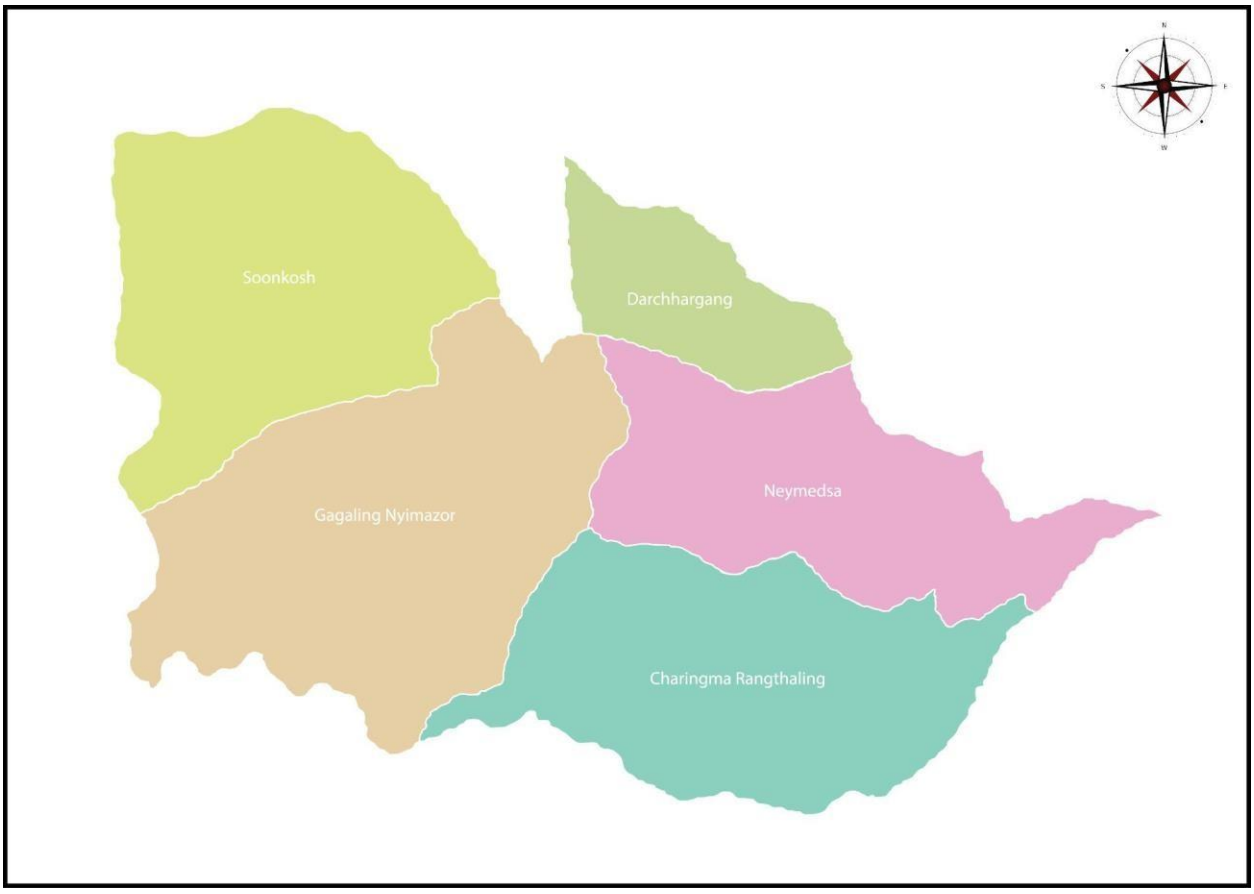
Spread over an area of 24.5 sq. km. at an altitude of about 600 to 1600 masl, Rangthangling has a total of five Chiwogs[22] – Darchhargang, Rangthangling Charingma, Nyimazor, Neymedsa and Sunkosh. The Chiwogs are further divided into 8 Villages with 423 households and a population of nearly 2,700 inhabitants. 80% of the Gewog is under forest cover.

Rangthangling Gewog Office is well connected to the Dzongkhag Centre by 4 km of blacktopped (asphalt-concrete) road.

[21] Tsirang Dzongkhag Website, Rangthangling Gewog http://www.tsirang.gov.bt/gewogs/rangthaling

[22] KII, Rangthangling GAO, Gewog Database 2023

Map 9. Map showing Rangthangling Gewog (including its Chiwogs)



Source: Map Prepared Based on Tsirang Dzongkhag Website, RGOB

Tsholingkhar Gewog[23]: One of the closest to the Dzongkhag Center, Tsholingkhar Gewog lies 8 km away from Damphu town. The Gewog shares its borders with Kilkhorthang and Gosarling to the east, Rangthangling to the south and Dagana district to the west. Owing to its location and the highway that traverses through, Tsholingkhar is among the more developed gewogs in Tsirang providing multitudes of business opportunities to many of the inhabitants.

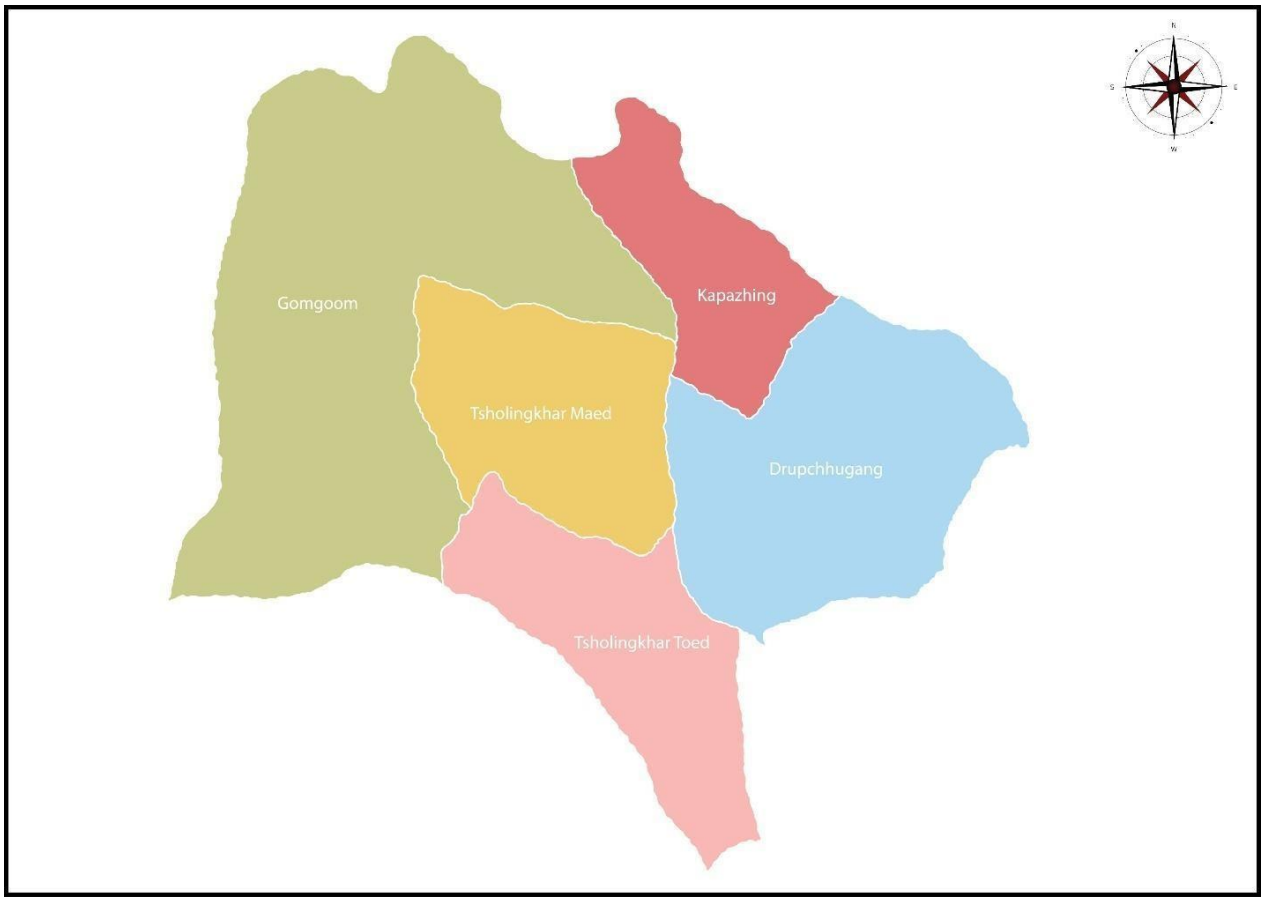
Tsholingkhar lies at an altitude of 800 to 1300 masl. and its total land area is 30.3 sq. km[24]. The total population of the Gewog is 3000 inhabitants spread across 353 households in its five Chiwogs – namely, Gomgoom, Kapazhing, Drupchhugang, Tsholingkhar Toed (upper), Tsholingkhar Maed (lower).

The Gewog is 100% electrified with mobile/internet coverage – all fundamental attributes for a conducive and progressive business environment.

[23] Tsirang Dzongkhag Website, Tsholingkhar Gewog http://www.tsirang.gov.bt/gewogs/tsholingkhar

[24] Flood Hazard Assessment for Tsirang, MoIT, RGOB, 2019 https://www.moit.gov.bt/wp-content/uploads/2019/02/Tsirang_Version2_KK.pdf

Map 10. Map showing Tsholingkhar Gewog (including its Chiwogs)



Source: Map Prepared Based on Tsirang Dzongkhag Website, RGOB

4.1.2. Topography, Geology and Soil

The topography in the country is shaped by the geological uplift and the lithological formations and the rivers. In the northern regions, the High Himalayas dominate with several mountain peaks and ranges with uneven and rugged crests. Within the central regions, there are both gentle and deep E-W and N-S valleys along the rivers. Towards the foothills, there are alluvial plains along the southern borders[25].

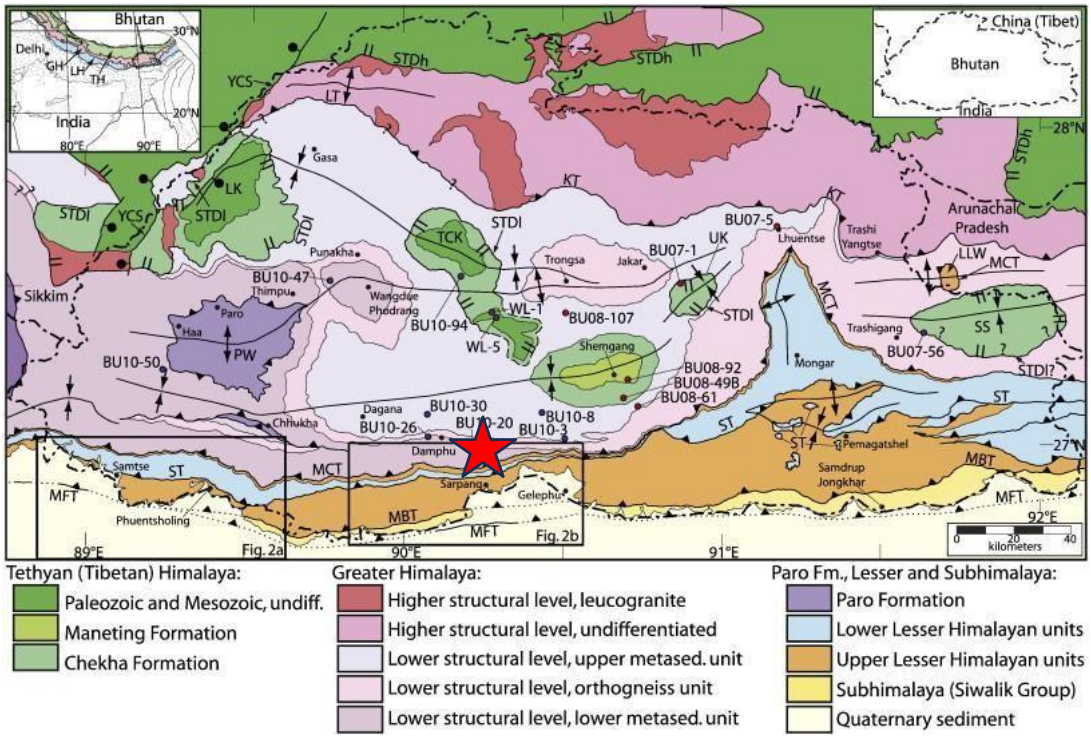
Like much of the rest of Bhutan, the terrain of Tsirang consists of deep forested mountains cut by fast flowing rivers and streams, running down to wider floodplains at lower altitudes with agricultural practices on both terraced and un-terraced slopes. The altitude in the Dzongkhag ranges from 400 to 2,000 meters above sea level.

The Himalayan fold-thrust belt/orogenic belt is traditionally divided into four from south to north. These include the Sub Himalayan (SH), Lesser Himalayan (LH), Greater Himalaya (GH), and

[25] Cencho, et al. 2003. Physiographic Zonation of Bhutan. Journal of Bhutan Studies

Tethyan Himalaya (TH). Their bounding fault systems include the Main Frontal thrust, the Main Boundary thrust, the Main Central thrust and the South Tibetan Detachment system. All the major tectonostratigraphic units and the tectonic structures within the Himalayan orogenic belt are exposed in Bhutan. The Himalayan Orogeny's tectonostratigraphic sequences were defined by metamorphic grade changes due to the abrupt juxtaposition of higher-grade rocks over lower grade rocks, evolving as these orogeny-structures propagated southward during India's collision with Eurasia.[26]

Map 11. Major Techno Stratigraphic Units and Tectonic Structures (project area marked as a star)

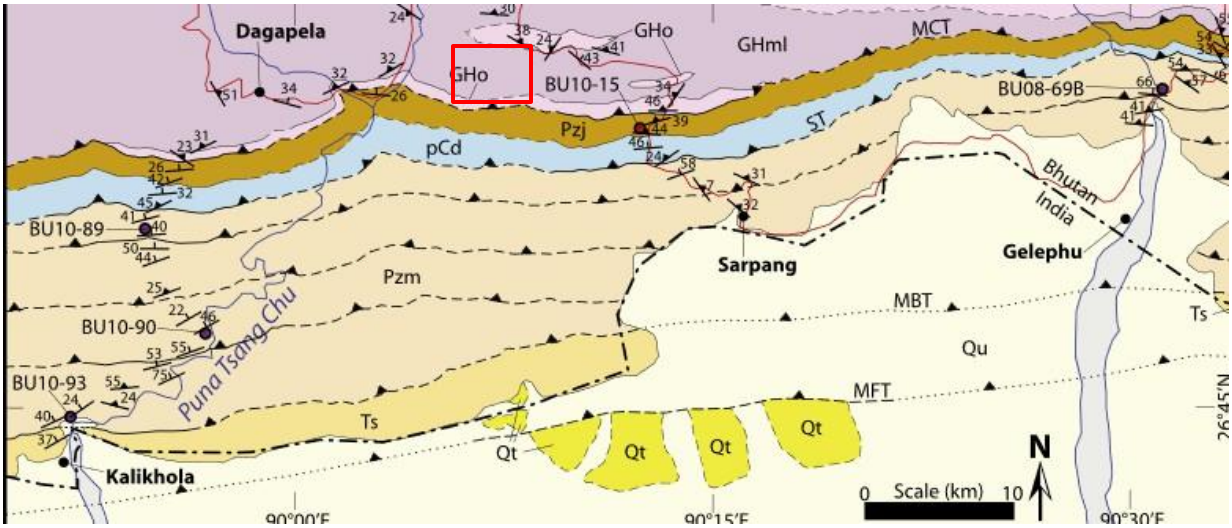


Source: McQuarrie et al, 2013[27]

[26] Duba, Kinzang, "Crustal Structure of the Bhutanese Himalaya: New Insights from a Gravity Analysis in Western and Central Bhutan" (2018). MSU Graduate Theses. 3240. https://bearworks.missouristate.edu/theses/3240

[27] McQuarrie et al, 2013. Documenting basin scale, geometry and provenance through detrital geochemical data: Lessons from the Neoproterozoic to Ordovician Lesser, Greater, and Tethyan Himalayan strata of Bhutan. Gondwana Research 23(4):1491–1510.
DOI:10.1016/j.gr.2012.09.002

Map 12. Techno Stratigraphic Zones and Formation (project area marked as a red box)



The maps show that Tsirang lies above the Main Central Thrust that runs along the entire country.

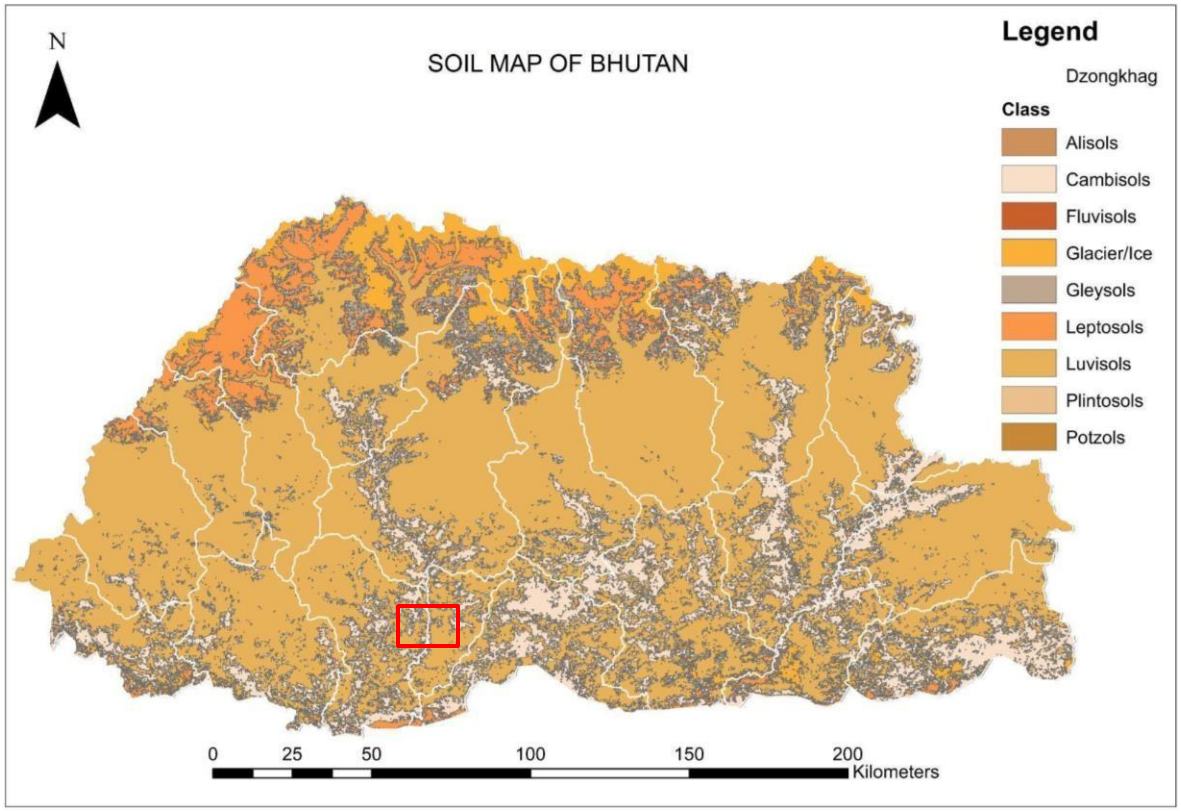
Table 17.. Tectonostratigraphic Zones, Formations and Prominent Lithologies in Tsirang.

Tectonostratigraphic zone	Formation	Prominent lithologies
Lower lesser Himalaya	Daling Shumar Group- Daling Formation (pCd)	Green schist and phyllite with orthogneiss intrusions
Upper lesser Himalaya	Jaisidanda formation (Pzj)	Biotite-rich, locally garnet-bearing schist with interbedded biotite-laminated quartzite, and uncommon marble bands.
	Baxa Group-Manas formation (Pzm)	Fine to medium grained, locally pebbly to conglomeratic quartzite interbedded with phyllite and dolomite.
Greater Himalayan Zone	Orthogneiss Unit (GHo)	Gneiss
Greater Himalayan Zone	Lower metasedimentary unit (GHlm)	Upper amphibolite to granulite-facies paragneiss with rare quartzite layers-a few 100 m in central Bhutan

Source: data compiled McQuarrie et al, 2013[28]

[28] McQuarrie et al, 2013. Documenting basin scale, geometry and provenance through detrital geochemical data: Lessons from the Neoproterozoic to Ordovician Lesser, Greater, and Tethyan Himalayan strata of Bhutan. Gondwana Research 23(4):1491–1510.
DOI:10.1016/j.gr.2012.09.002

Map 13. Soil Map of Bhutan (project area marked as a red box)



Okazaki (1987)[29] suggested that there are five major soil groups that are vertically distributed according to the altitude. The soils in the southern foothills are less weathered and leached due to the humid subtropical conditions.

Owing to the soil make up, Tsirang is among one of the major citrus-growing dzongkhags in the country. Citrus is among the most important horticultural cash crops grown in Bhutan. The staff of the National Soil Services Centre (NSSC) together with the Dzongkhag staff conducted a collection of soil samples from Tsirang at altitudes ranging from 1158 masl to 1333 masl. in 2005. The result of the samples collected was conclusive of the pH, organic matter (OM), relative nutrient requirements of Nitrogen (N) and Potassium (K), Cation-exchange capacity (CEC) and Base Saturation (BS)[30]. Details are indicated in Table 18 below.

[29] Okazaki M. (1987): Soils of the Bhutan Himalaya. In: Life Zone Ecology of the Bhutan Himalaya (M. Ohsawa ed.), Laboratory of Ecology, Chiba University, Tokyo, Japan; pp. 145-184.

[30] National Soil Services Centre 2005. Citrus soil report of Tsirang Dzongkhag.

Table 18..Soil Data for Tsirang.

Location	pH	OM%	Available N	Available K	CEC	BS%	Soil Type
Tsirang	Medium to High (20 – 30%)	2 – 5%	High	Medium to High	Low (5-15 meq/100g) to Medium (15-25 meq/100g	Medium to High	Sandy Loam and Loam

Source: NSSC, Citrus Soil Report of Tsirang Dzongkhag (2005)[31]

As the gewogs in Tsirang are very similar in terms of attitude and soil composition, it is therefore assumed that the pH value of the soil within the district is mostly within moderate ranges while the OM % varies between medium and high. The average CEC levels vary from low (5-15 meq/100g) to medium (15-25 meq/100g) while the BS% is mostly within medium to high ranges[32].

4.1.3. Climate and Air Quality

With an annual maximum temperature of 23.7°C and minimum temperature of 10.4°C in 2023, the district has a climate that is conducive for agricultural activities and production as well as hosting a rich biodiversity. The geographical area of Tsirang ranges from humid subtropical, warm temperate to temperate zones with 28.2% lying within the warm temperate zones between 1800 to 2600 masl.

The district's subtropical climate is characterized by adequate rainfall during the summer monsoon season (late June to October). The elevation of the Southern Foothills zone ranges from 100 m to 1,500 m with a temperature fluctuation of 15° to 30° C, indicating warm summers and mild winters. During the monsoon, the district receives annual rainfall precipitation measuring 1070.7mm[33]. Due to its size and location, the district has minimal variations in climate, therefore making Tsirang suitable for yearlong cultivation opportunities.

There is no data available on the air quality, however, owing to its low population and absence of heavy industry/industrial activities, the air quality is generally good in Tsirang Dzongkhag. Air pollution is mostly limited to the access roads due to vehicle emission but as traffic only consists of few vehicles owned by gewog staff and a few wealthier individuals, this is also very sporadic.

With 100% electrification, the use of wood for cooking is limited to cooking for livestock feed. Additionally, as most of the settlements are located at lower elevations where it is much warmer, the use of wooden stoves for heating is also almost negligible.

[31] https://www.nssc.gov.bt/wp-content/uploads/2021/04/tsirang-dzongkhag.pdf

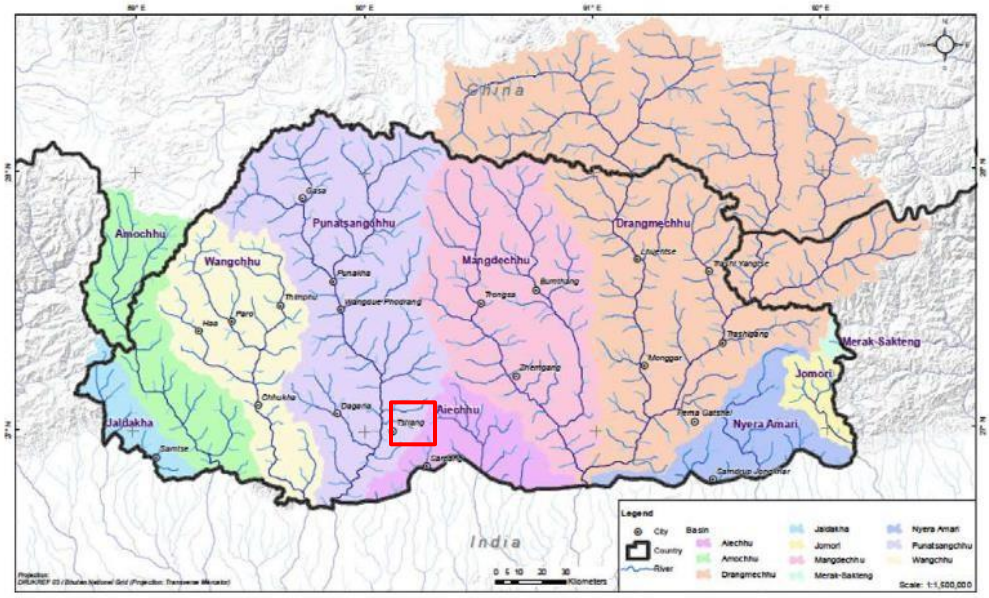
[32] NSSC, 2021, RGoB, Guide Fertilizer Recommendation, Soils of Bhutan, https://www.nssc.gov.bt/wp-content/uploads/2021/04/guide-fertlizer-recommendation.pdf

[33] Weather and Climate Services Division, NCHM, SYB 2023

4.1.4. Hydrology

There are five major river basins in the country: Amo Chhu, Wang Chhu, Punatsang Chhu, Mangde Chhu and Drangme Chhu[34]. Two of these (Amo Chhu and Drangme Chhu) originate in China. The rivers are mostly fed by rainfall, supplemented by an estimated 2% - 12% glacial melt and another 2% from snow melt. Other smaller rivers include Jaldakha, Aiechhu, Nyere-Amari, Jomori/Dhansari, and Merak-Sakteng. The combined outflow of the rivers is estimated at 70,576 million m3 per annum or 2,238 m3/s. (UWICER, 2018[35], NWRIM).

Map 14. Hydrological Basins and their Boundaries (project area marked as a red box)



Source: NEC, 2016[36]

The Punatsangchhu flows through Tsirang Dzongkhag. Dungri Khola and Sidha Khola flow through Kilkhorthang Gewog; Dara Chhu, Gatey Chhu, Kali Khola, Khuchi Khola and Pau Khola flow through Patshaling Gewog; and Tshokhona Chhu flows through Tsholingkhar Gewog[37]. The details for current water sources – both drinking and irrigation – are listed in Table 19 below.

Table 19..Current Water Sources, Status and Constraints of the Six Gewogs.

Gewog	Source & Location for Drinking Water	Source & Location for Irrigation Water	Status	Constraints
Mendrelgang	1. Paw Khola (Patshaling)	1. Ratey Khola (Mendrelgang) 2. Pungay Khola (Mendrelgang) 3. Maney Khola (Mendrelgang)	All Sources are Inadequate for drinking and irrigation purposes	• Budget Constraints

[34] NEC, 2016. National Integrated Water Resources Management Plan (NIWRMP)

[35] UWICER, 2018. Bhutan Water Facts

[36] NEC, 2016. National Integrated Water Resources Management Plan, 2016.

[37] NECS, National Water Resources Inventory (NWRI) 2018

		4. Boxing Khola (Patshaling)		
Barshong	1. Dabithan (Barshong Toed) 2. Gauri Khola (Barshong Maed) 3. Dhanpal (Barshong Toed) 4. Rati Khola (Gangtogkha)	1. Sarki Khola (Chunikhang) 2. Keray Khola (Barshong Maed)	**Drinking:** 1 - not adequate 2 - only enough for 50% **Irrigation:** 1 - only enough for 70% 2 - only enough for 60%	• Increase in population • Low elevation of rivers • Source drying up
Kilkhorthangang	1. Majwa (Sasangma) 2. Sidha Khola (Sasangma)	1. Tshokana Khola (Menchuna to Tshokana)	**Drinking:** 1 & 2 - not adequate **Irrigation:** Adequate for now	• Source drying up and an increase in demand from growing number of HHs • Deterioration of irrigation channels • Lack of maintenance • Disaster (landslide) related damage to the channels
Patshaling	1. Gopi Khola (Gopay Kholcha) 2. Khopi Khola (Thakorling) 3. Paw Khola (Thakorling) 4. Sil Silay (Saepelay)	1. Gopi Khola (Thakorling) 2. Auewseyla Khola (Thakorling)	**Drinking:** 1, 2 & 3 - adequate 4 - dried up **Irrigation:** 1 - not adequate 2 - moderately adequate	• Volume decreases when supply Municipal and Mendrelgang supply is higher • Gopi Khola has almost dried up after 2-3 years of the supply line being established
Rangthangling	1. Khuchi Khola (Patshaling) 2. Chesay (Neymedsa) 3. Chuan Kharkay (Neymedsa)	1. Streams around Rangthangling	**Drinking:** All – not adequate **Irrigation:** Not adequate	• Issues related to sanitation and hygiene • Streams for irrigation are drying up
Tsholingkhar	1. Chuan Kharka (Drupchhugang) 2. Khuchi Khola (Tsholingkhar Toed)	1. Thing Khola (Drupchhugang) 2. Streams (Menchuna)	**Drinking:** All – adequate from mid June to November, not adequate from December to mid-June **Irrigation:** All – not adequate	• Challenges due to seasonal availability

Source: KII, Community Consultations with Gewogs (12th October 2023)

Table 20.WUA/WUG Members and Mandates of the Six Gewogs.

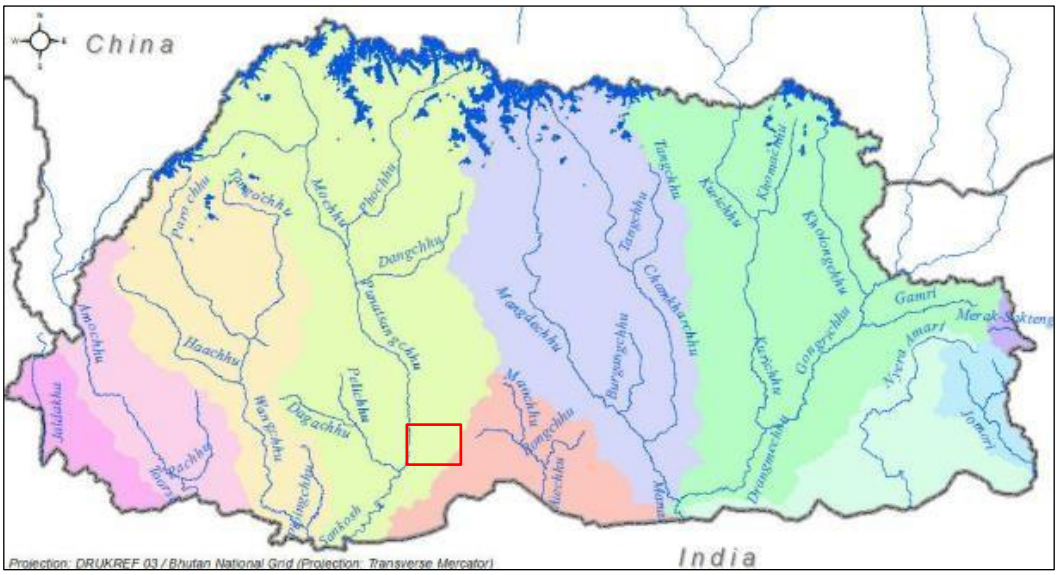
Gewog	Water User Association/Group	Members(# HHs)	Female Members	Mandates of the Association
Mendrelgang	15 Associations	70	43%	• Management and care of water supply, pipes, and source • Ensuring timely payments for caretaker • Annual user fee collection of Nu. 200/- per HH
Barshong	15 Associations	Data NA	10%	• Commuters using the road to the sources contribute to maintenance and functionality • Survey carried out by 2 people every fortnight • Ensuring timely payments for caretaker • Only the caretaker is allowed to perform maintenance for the pipes and source • Gewog intervenes when the issue is severe • Drinking water and irrigation water are strictly used only for their specified purposes • Nu. 200/- per HH is paid towards caretaker fees from Annual user fee collection
Kilkhorthang	3 Associations	Data NA	10% (one per association)	• Ensuring timely payments for caretaker • Only the caretaker is allowed to perform maintenance for the pipes and source • Drinking water is only meant for drinking but what you do with your allocated drinking water is up to each HH • Each HH has a 200-liter syntax tank and gets water according to their scheduled time • Progressive interventions by community and Gewog depending on severity of issue • Nu. 300/- per HH is paid towards caretaker fees from Annual user fee collection (varies from Chiwog to Chiwog)
Patshaling	3 Groups	132	68%	• Integrated as per District and National regulations into the community context • 2 caretakers at each given time who are volunteers from among the member HHs (unpaid)
Rangthangling	7 Associations	>100	30%	• Nu. 200 -300/- per HH is paid towards caretaker fees from Annual user fee collection • Communications vouchers provided by some Chiwogs • Caretakers shall be male due to the physically challenging requirements of the job

Gewog	Water User Association/Group	Members(# HHs)	Female Members	Mandates of the Association
Tsholingkhar	2 Groups	62	50%	• Integrated as per District and National regulations into the community context • Caretaker fee is paid from Annual user fee collection per HH • Collective bank account is managed by the Chairperson and Treasurer

Source: KII, Community Consultations with Gewogs (12th October 2023)

Glaciers are found within the elevation range of 4,050 to 7,230 masl. Of the total, there are 466 glaciers in Punatsangchhu basin[38].

Map 15. Map showing Glaciers in Bhutan (project area marked in red box)



Source: NEC, 2016

4.1.5. Water Quality

Water quality for the two water sources were tested by the Royal Centre for Disease Control, Ministry of Health, Thimphu in November 2023. Both water samples show very low levels of Thermotolerant coliform which indicates that the water may be contaminated with fecal matter.

[38] UWICER, 2018. Bhutan Water Facts.

Table 21..Results of the Water Quality Compared to the Rural Drinking Water Quality Standards 2016.

	Parameters	Limit	Safety limits	Source 1	Source 2
Physical					
1	Conductivity (µS/cm)	1000		37.9	22
2	Odor	Un-objectionable		Un-objectionable	Un-objectionable
3	Appearance	Un-objectionable		Un-objectionable	Un-objectionable
4	pH	6.5-8.5		6.7	6.8
5	Taste	Un-objectionable		Un-objectionable	Un-objectionable
6	Turbidity (NTU)	5		3.37	2.06
	Microbiological				
1	E-Coli (CFU/ml)	0	Safe		
		1-10	Low health risk		
		11-50	Intermediate to high health risk		
		>50	Grossly polluted		
2	Thermotolerant coliform (CFU/100ml)	0		4	2

Source: Bhutan Drinking Water Quality Standard, 2016, National Environment Commission, Royal Government of Bhutan, 2016 and Royal Centre for Disease Control, Ministry of Health

4.1.6. Natura Hazards and Disaster

Given its location and geological conditions, Bhutan is prone to earthquakes and storms caused by regional cyclones. Due to the risk of widespread damage, this risk has been rated as 'high' for Tsirang Dzongkhag[39]

Another 'high risk' for Tsirang is Landslides. Due to the rugged and steep terrain, landslides are triggered by incessant rains and anthropogenic hazards such as road and construction and other development on steep slopes including types of land use and forest clearance. Landslides induced by rains occurred in 2016 and 2017 damaging both public and private property.

Fires and Windstorms are 'medium risk' because of the risk of causing extensive damage to forest, public and private property. Windstorms are common in March- May, while forest fires are common during the dry winter season. However, in the recent past, these have only been reported in 2015, 2018 and most recently in 2022[40] .

[39] Tsirang Dzongkhag 2019. Disaster Management and Contingency Plan

[40] Tsirang Dzongkhag 2019. Disaster Management and Contingency Plan

Table 22. Hazard Assessment for Tsirang.

Hazards	Secondary Hazard	When it could occur	Probability of Occurrence	History/Past disaster	Impact
Windstorm	Structural Fire	March, April, May	Medium	April, 2015	88 HHs affected
Landslides	Flash Flood	June-September	High	2016,2017	Public and Private Infrastructures, Firm roads, Private Lands
Structural Fire	Forest Fire	Winter Season	Medium	2018	2 houses affected
Bush Fire	Structural Fire	Winter season	Medium	2018	14 acres affected
Lightning and Thunder	Structural Fire/Forest Fire	Summer season	Medium	2016	Electric lines short circuited and a Woman electrocuted
Earthquake	Landslide, Structure Fire	Anytime	High	2009, 2011	More than 100 HHs affected

Source: DMCP, Tsirang 2019

Apart from a forest fire in Mendrelgang Gewog (Zomlinghor) in 2022 there have been no recent incidents of forest fires in Tsirang[41]. The Annual Dzongkhag Statistics 2023 from NSB have indicated the types of land area damage and causes, however, no numbers are indicated - only landslides and floods are mentioned.

In June 2022, a flash flood and landslide advisory were issued for the southern parts of the country including Tsirang[42]. Roadblocks were reported from various parts of the country. A Kuensel article from February 2023[43] also mentions the vulnerability of Rangthangling, Tsholingkhar, Phuntenchhu, Tsirang Toed and Sergithang. All these gewogs are highly prone to forest fires owing to the abundance of chirpine growing in neighboring areas. Rangthangling and Tsholingkhar Gewogs are within the project scope. The table below summarizes Natural Hazards and Disasters in the six gewogs.

Table 23. Incidents of Natural Hazards and Disasters in the Six Gewogs.

Gewog	NH/D Type	Year/HH Impacted	Remarks
Mendrelgang	Flood Fire Windstorm	2023 - All Chiwogs 2022 - Zhomlingzor Chiwog 2022	HDP pipe damaged, farm roads washed away Crops damaged Roofs damaged
Barshong	Flood Landslides Crop Diseases	Yearly Yearly Yearly	Minor damage to roads, crops, and irrigation channel Heavy damage to infrastructure 30% of the Gewog suffers loss of maize and paddy
Kilkhorthang	Flood Landslides	Yearly Yearly	Source and HHs affected, usually minor damage Minor damage to roads, source and HHs
Patshaling	Earthquake Windstorm Diseases Landslide	2023 - NA 2022/2023 - 2 HHs Seasonal - All Chiwogs 2023 – 2 HHs	NA Roof damage, animal sheds blown away Minor waterborne diseases like diarrhoea Occurs yearly (high rainfall season), walls damaged
Rangthangling	Windstorm Diseases	2023 - 9 HHs 2023 - 50% of the Gewog	Damage to houses and crops Loss of livestock

[41] Foresters caution residents on forest fire in Tsirang | Kuensel Online

[42] NCHM, ANNUAL REPORT 2022-2023

[43] Foresters caution residents on forest fire in Tsirang | Kuensel Online

Gewog	NH/D Type	Year/HH Impacted	Remarks
	Crop Diseases	2022/2023 - 50% of the Gewog	Damage to crops
Tsholingkhar	Earthquake Flood Windstorm Diseases	2023 - NA 2023 - All HHs 2023 - 90% of the Gewog 2023 - All HHs of the Gewog	NA Highway roadblock at lower Drupchhugang High impact - however, impacts are lessening each year Minor waterborne diseases

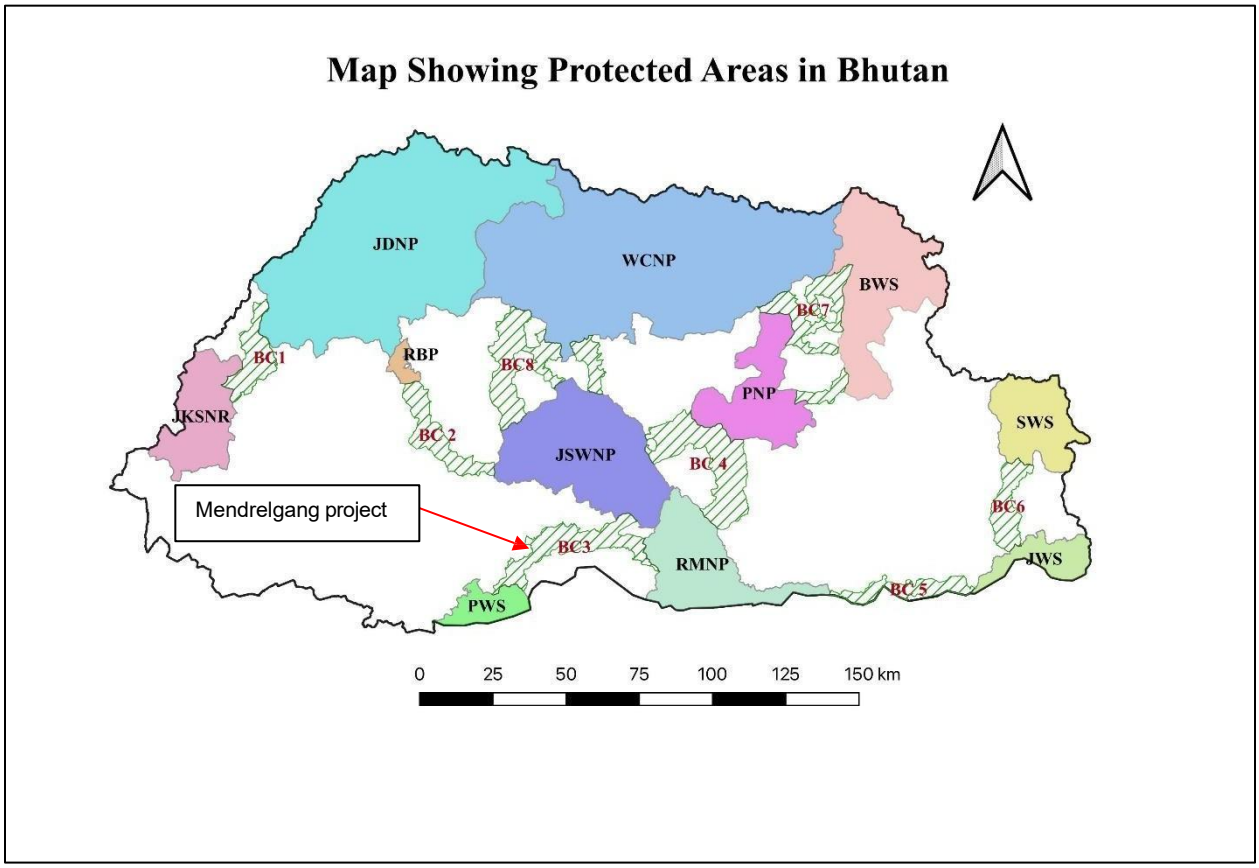
Source: KII, Tsirang Dzong Consultations, 11th October 2023

4.2. Ecological Resources

4.2.1. Protected Area and Wetland

51% of the country is under protected area status. This includes 5 national parks, 4 Wildlife Sanctuaries, 1 Strict Nature Reserve, 1 Royal Botanic Park and 8 Biological Corridors[44].

Map 16. Protected Area System of Bhutan and Project Area



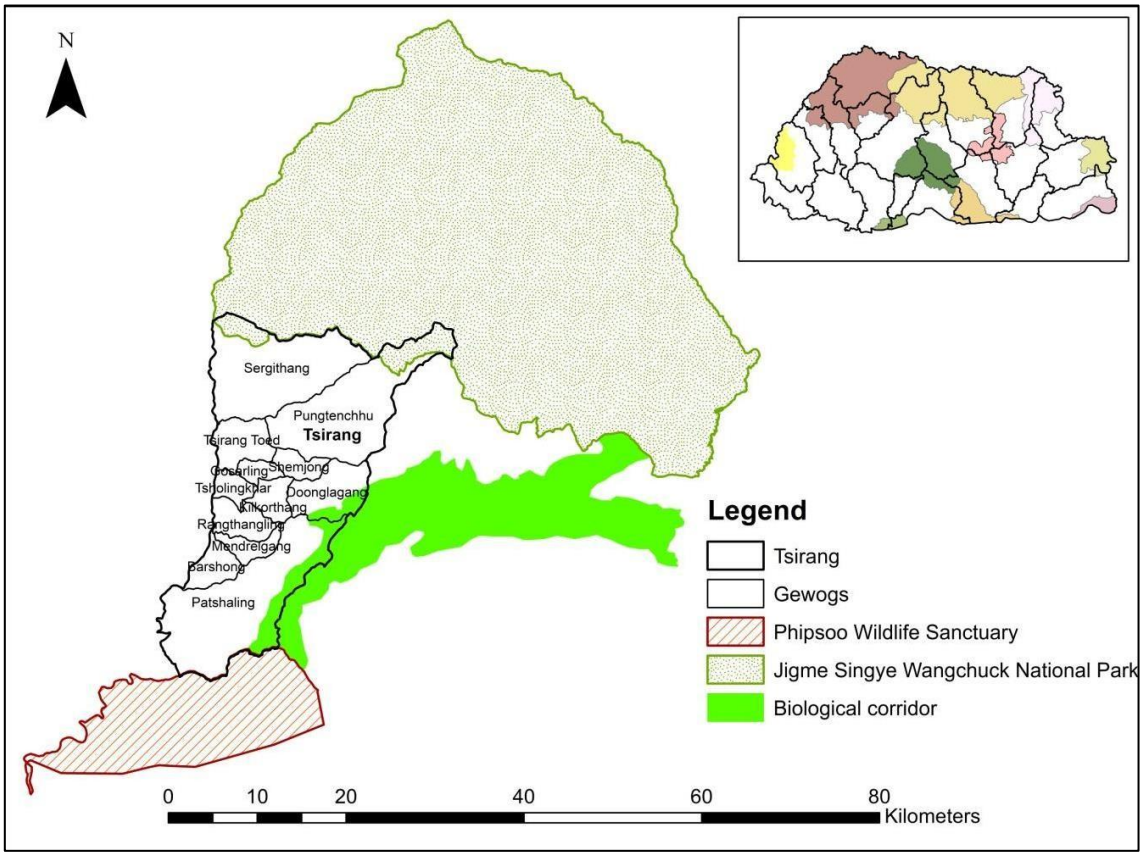
Source: DOFPS. 2022 and google earth.

[44]DOFPS, 2019. Forest Facts and Figures

Biological Corridor (BC) 3 connects three protected areas (Jigme Singye Wangchuck National Park (JSWNP), Royal Manas National Park (RMNP) and Phibsoo Wildlife Sanctuary (PWS). BC 3 has a total area of 376.60 sq. km of which 90% falls within Sarpang Dzongkhag and 10% under Dzongkhag[45].

Parts of Patshaling Gewog lies within BC 3. There are no natural wetlands within or close to the project area in all the project gewogs.

Map 17. Map showing Protected Areas and Biological Corridors in Tsirang

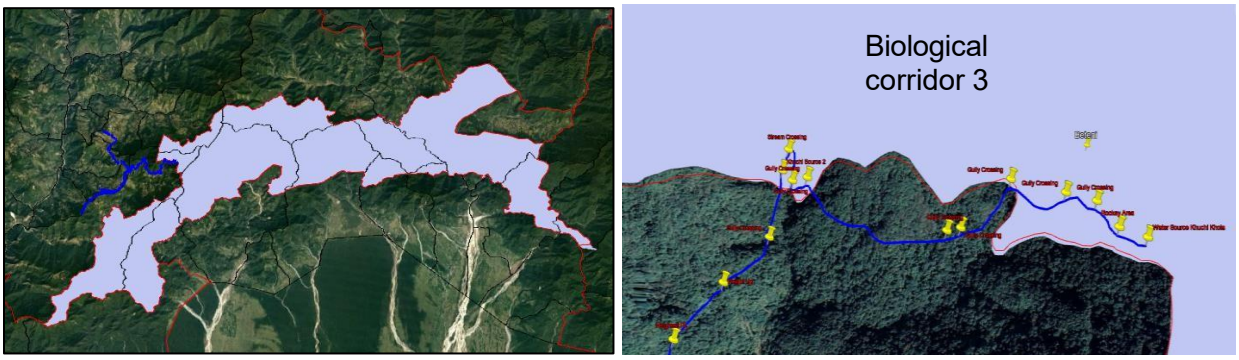


Source: Map prepared based on kmz file from DOFPS.

The two water sources in Patshaling Gewog lie within Biological Corridor 3 (BC3) and 0.6 km of the main water pipeline will traverse BC3 at two places (0.6 km from water source 1, and 0.4 km at water source 2).

[45] DOFPS, 20220. Bhutan For Life. Environmental and Social Management Plan for Biological Corridor 3 (2020)

Map 18. Map of water pipeline in BC 3



Map source: google earth with data on PAs from DOFPS and project components from MoIT.

4.2.2. Forest Cover

Bhutan has a forest cover of 69.7%[46] out of which Tsirang covers 55,265.1 Ha. 55,265.1 Ha of Tsirang is under forest cover – this constitutes 87.5% of its total area. Out of the total 55,265.1 Ha of forest cover in Tsirang, 19,215.28 Ha are under forest cover across Mendrelgang, Barshong, Kilkhorthang, Patshaling, Rangthangling and Tsholingkhar. This constitutes 34.8% of the total forest cover in the six gewogs. The varieties in forest cover include Broadleaf, Chirpine and Shrubs (2.47%)[47]. Given the district's size, its similarity in altitude variation across its gewogs, weather patterns, climate, soils, crops grown throughout is further evidenced by the data regarding forest cover and types of vegetation found in Tsirang. These uniform characteristics derived from both primary and secondary sources and data collection stands testament to a more pronounced uniformity of the district's geography and topography.

The project area comprises mostly of broadleaf forest. Towards the source, the forest is virtually untouched. During the site visit, some of the common trees include *Alnus nepalensis, Castonopsis hystrix, Eurya acuminata, Lithocarpus elegans, Engalhardia spicata, Maranga denticulata* and *Myrica esculenta.* The undergrowth is lush and dense with common shrubs such as *Daphne suriel, Dichroa fubrifuga, Symplocus sumantia, Callicarpa rubella, Cinamomum glaucescens* and *Melastroma normale* among others. *Piper longum, Polystichum spp* , *Tetrastigma serrulatum* and *Eupatorium adenophorum* are the most common herbs. The vegetation list is summarized in Annex 8.

[46] Department of Forest and Park Services, 2023. National Forest Inventory Report 2023.

[47] NLCS, Land Use Land Cover, 2016

Photo 5. Forest at the project site

Photo 6. Forest and settlement

Community Forest: Tsirang boasts of a total of 50 CFs spread over an area of 9,558.83 Ha[48] in its 12 gewogs. There has been a significant growth in the number of CF group members (HH) from 1,488 in 2019 to 3,004 in 2021 covering 23,835.7 acres[49]. During the public consultation it has been confirmed that there are no communities in the project areas that depend largely on forestry resources as a source of livelihood.

Despite its comparative size, Tsirang has one of the highest areas of CFs (highest being Trashigang followed by Mongar – both of which are much larger districts) and one of the highest percentages of rural households contributing to CF management, second only to Trashigang Dzongkhag[50].

The trench size for the pipeline is 1.2 m wide by 1.5 m deep for which a working corridor of 3 m is anticipated although no trees will be cut beyond 1.2m. The Contractor will be required to inform the nearest forest office who will then mark the trees, which are then cut and removed by the Natural Resource Development Corporation, or by the contractor depending on the availability of the NRDCL. The timber within the CF will be utilized by the CFMG, while the timber within the SFRL can be obtained by the community upon approval from the Forest Office. Trees that will require to be felled include *Castanopsis Hystrix, Betula alnoides, Alnus nepalensis, Acer Oblongum, Lithocarpus elegans* and Schima wallichii. The Forest clearance does not state the total number of trees to be cut.

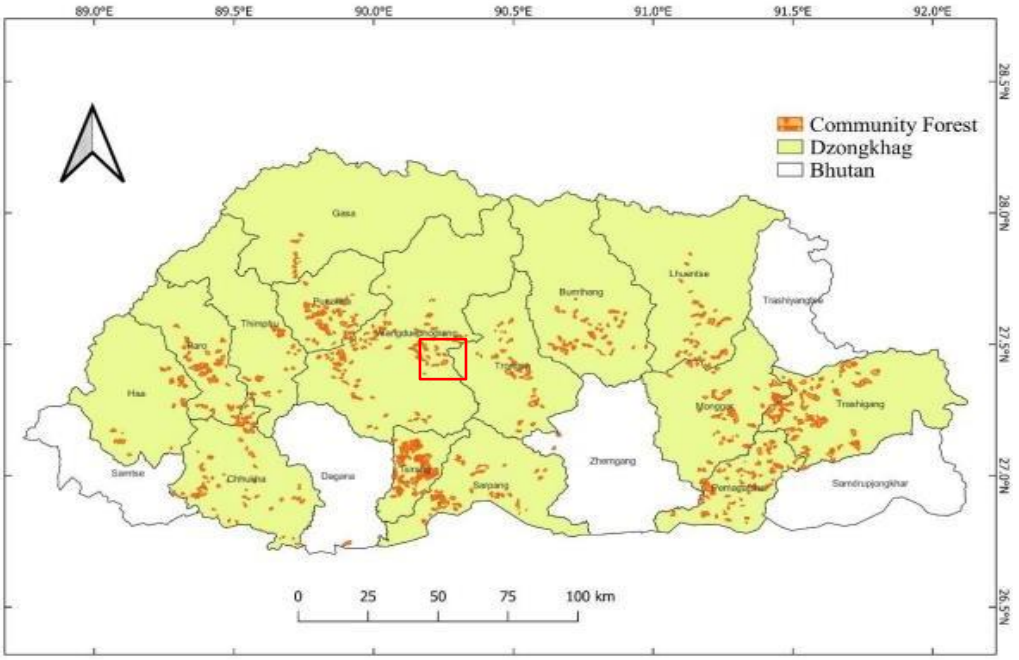
The total water pipeline length is 40.3 km of which 35.3 km (85%) passes through SRFL (1 km in the biological corridor and 0.77 km through the two CFs). The remaining 5 km would traverse through private land. Based on the length of the water pipeline through the SRFL and BC, the corridor to be cleared for the trench is estimated at 6.36 Ha. The total area required for other infrastructure (intake area, sand trap, reservoir, break pressure tanks and take off chambers) is 0.31 hectares, resulting in a total project footprint of 6.67 Ha.

[48] Annual Dzongkhag Statistics 2023, Tsirang, NSB

[49] 1 Ha = 2.47105381 Acres

[50] The Bhutanese, Community Forest's increasingly benefit rural communities and the local environment, 2016 https://thebhutanese.bt/community-forests-increasingly-benefit-rural-communities-and-the-local-environment/

Map 19. Community Forest Study Sites in the Country (project area marked as a red box)



Source: Tshering, D. et al. (2023). Three decades of Community Forestry in Bhutan: an assessment report of the review of its extent and management effectiveness. Ugyen Wangchuck Institute for Forestry Research and Training, Lamaigonpa, Bumthang

As of 2019, 164 Non-Wood Forest Product (NWFP) Management and Marketing Groups have been established across Bhutan. Of these, Tsirang has the least number of NWFP groups with only 38 households in the entire district[51]. The water pipeline will not restrict access to the forest for the NWFPs as the trench width is only 1.2m wide and it will be covered up once the pipelines are laid.

4.2.3. Biodiversity

Nationwide, the high forest cover provides natural habitats for many species. There are around 5,600 species of vascular seed plants, of which 94% are native. and 200 species are used for medicinal purposes. 282 species under 156 genera of Bryophytes and 350 species of fungi and 287 lichens have been recorded. About 129 species of mammals are known to occur in the country, including 26 globally threatened species, including 11 of the 36 globally recorded felid species. 736 species of birds including 30 globally threatened species. 750 species of Butterflies, 158 species of amphibians and reptiles and 120 species of fish have been recorded so far[52]

Bhutan has 3 RAMSAR sites. These are located in in Khotokha and Phobjikha under Wangduephodrang Dzongkhag and Bumdeling under Trashi Yangtse Dzongkhag [53]. There are

[51] DOFPS, 2019. Forest Facts and Figures

[52] NBC website https://nbc.gov.bt/species-diversity/

[53] Ministry of Agriculture and Forest 2014. National Biodiversity Strategy and Action Plan

no RAMSAR sites in Tsirang Dzongkhag. The project site does not fall along any migratory routes of species.

Vegetation: Rapid biodiversity assessments were carried out at each plot (20 x 40 m for tree and shrubs and 3 plots of 2 x 2 m for herbs).In total 11 plots were laid out at various locations, within which vegetation and wildlife species were noted.

In total 17 tree species, 25 shrubs and 39 herb species were recorded in these plots. The most common trees are *Castonopsis hystrix, Alnus nepalensis, Eurya acuminata, Myrica esculenta, Lithocarpus elegans* and *Schima wallichii.* The most common shrub species are *Daphne suriel, Cinamomum glaucescens, Callicarpa rubella, Maranga denticulate, Melastroma normale, Dichroa fubrifuga, Symplocus sumantia, Trevesia palmata, Ardisia mycrocarpa* and *Plectocomia himalayana.* The ground cover is dominated by *Polystichum spp, Adenostemma Lavenia, Begonia spp. Bidens Pilosa, Diplazium esculentum, Elatostema lineolatum,* Pilea spp. *Piper longum, Plagiogyria communis, Prunella vulgaris, Tupistra wattii* and invasive species such as *Eupatorium adenophorum*

Wildlife: Within the project area, five mammal species were identified either through direct observation, sound or scats, pellets, dungs and burrows during the field surveys. Bird species occurring in the project area were observed and recorded by direct observation of sight and calls.

The most common mammals observed include Barking Deer, Wild Pig and Assamese macaque. Of the species recorded, the Golden Langur is listed as Endangered under the IUCN Red List and is listed in Schedule II of the FNCA. The Macaques, Wild Pig, Barking Deer and Porcupines are considered are the primary species causing crop damage to the local farmers[54].

Table 24.Wildlife Recorded During the Site Visit.

#	Common name	Scientific name	Type of evidence	Frequency	IUCN Status	FNCA 2023
1	Assamese Macaque	*Macaca assamensis*	Sound, mark on trees, direct sighting (2)	3	NT	Schedule III
2	Yellow throated-Marten	*Martes flavigula*	Scat	1	LC	Schedule III
3	Barking Deer	*Muntiacus muntjak*	Dropping, footprint and browsing	8	LC	Schedule III
4	Wild Boar	*Sus scrofa*	Dropping, rooting, footprint, nest	8	LC	Schedule III
5	Golden Langur	*Trachypithecus geei*	Direct sighting	1	E	Schedule II
6	Himalayan Crestless Porcupine	*Hystrix bracyhura*	Community consultation		LC	Not Listed
7	Snake	Not identified	Direct sighting	1		

E- Endangered; Vulnerable- Vulnerable; NT- Near Threatened; LC- Least Concern,

[54] Community consultation October 12, 2023

Fauna in the vicinity of the stream may be disturbed by construction activities during the construction phase but this will be temporary lasting only until during the construction phase. The maintenance of the eflow will ensure water for wildlife species during the operation phase.

Birds: In total 58 bird species (Annex 8) were recorded during the two days. The most common birds are the Myna, Red-vented Bulbuls, Ashy Drongo, Black Drongo, Grey Tree pie, Blue-winged Minla, Rufous Sibia Verditer Flycatcher, White-crested Laughing Thrush, and White-throated Laughing Thrush. From the list of birds recorded, the Great Hornbill is listed as Vulnerable under the IUCN Red List and is listed in Schedule II of the FNCA, while the Rufous-throated Wren-babbler is listed as Near Threatened under the IUCN Red List and is listed in Schedule III of the FNCA. The other four species are not Least Concern but included in Schedule III of the FNCA

Table 25. Birds of Importance Recorded During the Site Visit.

#	Common name	Scientific name	IUCN Status	FNCA 2023
1	Eurasian Sparrowhawk	*Accipiter nisus*	LC	Schedule III
2	Great Hornbill	*Buceros bicornis*	V	Schedule II
3	Hill Partridge	*Arborophila torqueola*	LC	Schedule III
4	Large Hawk-cuckoo	*Hierococcyx sparverioides*	LC	Schedule III
5	Rufous-throated Wren-babbler	*Spelaeornis caudatus*	NT	Schedule III
6	Speckled Woodpigeon	*Columba hodgsonii*	LC	Schedule III

During the community consultation, it was noted that no fish was recorded upstream at the source of Khuchi Khola. No stream ecology was conducted as part of the field visit and no fish was observed in the stream during the field visit.

4.3. Socio-Economic Aspects

4.3.1. Demography

With a population density of 37.2 per sq. km in 2022, the total population in Tsirang for 2023 is 24,073 (12,384 male and 11,689 female) inhabitants spread over 12 Gewogs (Blocks), 60 Chiwogs (Sub-Blocks) and 101 Villages[55].

The district hosts a majority of the Lotsampa population of the country along with a significant number of immigrants and resettled groups from other districts comprising of Ngalongs and Sharchops[56].

According to the summary of key indicators for Tsirang (2017), the median age of the population was 29 years while the literacy rate was at 66.4% with males composing 75.2% and females comprising 56.9%.

[55] RGOB, Dzongkhag Administration, Tsirang http://www.tsirang.gov.bt/embedded-files/tsirang-glance

[56] KII, 11th October 2023, Tsirang Dzongkhag Consultation

4.3.2. Socio-Cultural Groups

The project area comprises mostly of Lhotsampas, who are mostly Hindus, within which there are the sub-groups such as the Brahmins, Rai, Limbu, Sherpa, Tamang, Magar, Gurung and Chettri. These subgroups are widespread throughout Mendrelgang, Barshong, Kilkhorthang, Patshaling, Rangthangling and Tsholingkar. The second majority are the Ngalongs followed closely by Sharchops spread across several households who have resettled in the area from various parts of Bhutan. These groups speak Ngalongpa, Sharchokpa, Khengpa and Bumthap. All subgroups also practice their own ways of conducting rites and rituals during births and deaths in the family. There has been an integration within the community and a practice of reciprocity with members coming together to assist their neighbours to celebrate together and provide moral support during times of birth, marriage, and death according to the practice of the rejoicing/affected household.

Due to the numerous socio-ethnic groups in the district, the diverse intangible cultural resources are abundantly practiced. These include annual celebrations like Losar, Sharchop Losars, Dassain, Tihar and Diwali as well as significant religious holidays like Krishna Janmashtami and Thruebaab.

Thruebab or the Blessed Rainy Day is celebrated throughout all gewogs, and this is characteristic of the agricultural activities that the communities are invested in. A majority of the inhabitants in each district are farmers and farming is the main activity for source of income and sustenance. This is attributed to the significance of Thruebab that is recognized as a distinct representation of its importance to farmers as this religious and climatically significant holiday signifies the end of the rainy season and the beginning of harvest season.

4.3.3. Land use, Agriculture and Industry

With more than 87.5% forest and 2.18% shrub cover, the remaining land area is used for agriculture (9.03%). With a built-up area of less than 1%, settlements in the district are spread within the gewogs. The largest settlement is Damphu town, the only economic hub in the district, where the District Headquarters is located.

Table 26.Land Use and Land Cover Data within the Project-specific Gewogs.

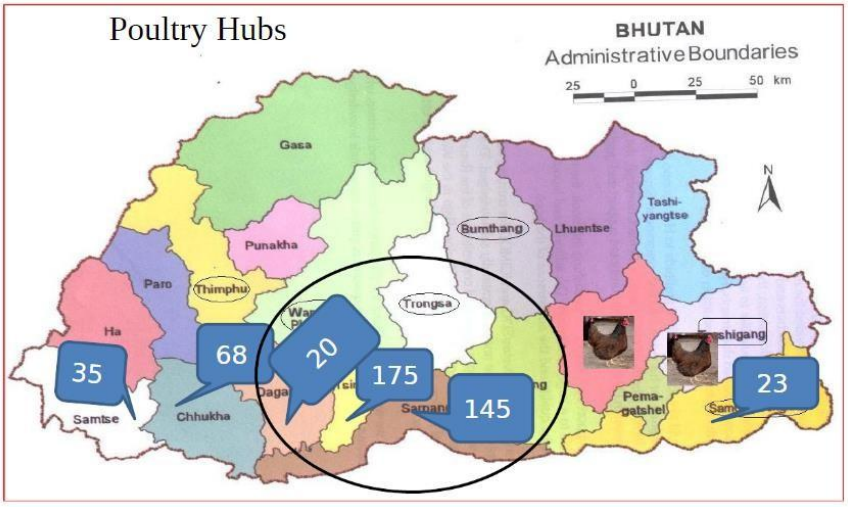
		BARSHONG		KILKHORTHANG		MENDRELGANG		PATSHALING		RANGTHANGLING		TSHOLINGKHAR	
Land Cover Class	**Land Cover Subclass**	**Area (Ha)**	**Area (%)**	**Area (Ha)**	**Area (%)**	**Area (Ha)**	**Area (%)**	**Area (Ha)**	**Area (%)**	**Area (Ha)**	**Area (%)**	**Area (Ha)**	**Area (%)**
Built Up	Built Up	1.68	0.08	41.39	2.36	3.74	0.26	2.34	0.02	5.22	0.21	2.63	0.20
Cultivated Agriculture		282.61	13.12	718.25	40.95	522.69	35.60	541.52	4.01	453.67	18.64	564.17	43.42
	Chhuzhing	123.34	5.73	357.38	20.38	154.09	10.50	132.87	0.98	114.56	4.71	288.44	22.20
	Kamzhing	150.76	7.0	348.83	19.89	350.49	23.87	399.76	2.96	311.31	12.79	234.55	18.05
	Orchards	8.52	0.40	12.04	0.69	18.11	1.23	8.89	0.07	27.80	1.14	41.18	3.17
Forest	Forest Type	1645.97	76.42	977.36	55.73	869.43	59.22	12725.45	94.18	1778.79	73.08	666.27	51.27
	Broadleaf	1645.97	76.42	977.36	55.73	869.43	59.22	8656.47	64.06	1778.79	73.08	638.00	49.10
	Chirpine	0	0	0	0	0	0	4068.98	30.11			28.27	2.18
Landslides	Landslides	8.42	0.39	0	0	0	0	3.00	0.02	5.24	0.22	0	0
Meadows	Meadows	0	0	1.03	0.06	0	0			0	0	0	0
Non-Built Up	Non-Built Up	0	0	0	0	0	0	1.78	0.01	0	0	0	0
Shrubs	Shrubs	139.42	6.47	14.81	0.84	71.94	4.90	150.63	1.11	140.57	5.77	34.64	2.67
Water Bodies		75.86	3.52	1.00	0.06	0.40	0.03	87.39	0.65	50.64	2.08	31.73	2.44
	Rivers	75.86	3.52	1.00	0.06	0.40	0.03	87.39	0.65	50.64	2.08	31.73	2.44
Grand Total		**2153.96**	**100.00**	**1753.85**	**100.00**	**1468.2**	**100.00**	**13512.11**	**100.00**	**2434.12**	**100.00**	**1299.44**	**100.00**

Source: Land Use Land Cover, NLCS 2016

Photo 7. Village in Patshaling Gewog below the waterpipe alignment

Photo 8. Villages along the water pipeline alignment

Map 20. Poultry Hubs in Bhutan



Source: Overview of poultry Sector Development in Bhutan, Karma Wangdi, MoAF (2019)

The livelihood of the inhabitants across the six gewogs comprises most agrarian activities with each gewog having more than 50% of farmers. Details of the livelihood per Gewog are listed in Table 27.

Table 27. Livelihood Data for the Six Gewogs.

Gewog	Farmers	Government/Corporate Employees	Private Business	Unemployed	Others[57]
Mendrelgang	80%	10%	10%	0%	0%
Barshong	60%	20%	10%	10%	0%
Kilkhorthang	70%	20%	10%	0%	0%
Patshaling	90%	4%	5%	1%	0%
Rangthangling	90%	7%	2%	0%	1%
Tsholingkhar	85%	10%	5%	0%	0%

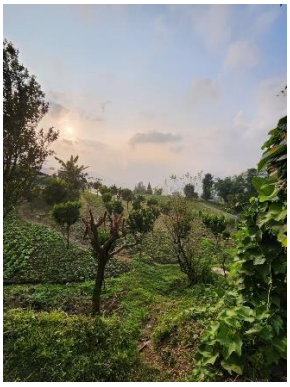
Source: KII, Tsirang Dzongkhag Consultations (11th October 2023)

[57] Residents of the Gewog but have temporarily moved for work in other Gewogs, especially due to cheaper rent

Photo 9 a-d. Goat and cattle farming

Photo 10. Poultry farm

Photo 11a-c. Model Farm in Mendrelgang and community sale outlet on the highway



In 2020, there were 342 trade, hotels, and restaurants, 260 industry, and 44 construction license holders[58]. The district has 235 poultry farms, 120 Fisheries, 220 piggeries and 2 food processing units[59]. Although the smallest by area size, Tsirang has one of the highest number of poultry farms in the country[60].

4.3.4. Drinking Water, Sanitation and Waste

As per the 2021 data from NSB, 100% of Tsirang households have latrine facilities with 99.9% connected with functional piped water and water supply. 19% of the households have a garbage pit for domestic waste disposal. Households with animal sheds account for 19% and 74% of the households have vegetable gardens.

The gewog level data for drinking water, sanitation and domestic waste is detailed in Table 28.

[58] NSB, Tsirang Dzongkhag at a Glance 2021.

[59] NSB, Tsirang Dzongkhag at a Glance 2021.

[60] Wangdi, Karma, "Overview of Poultry Sector in Bhutan" (2019). MoAF https://www.researchgate.net/publication/332606823_Overview_of_poultry_Sector_development_in_Bhutan

Table 28.Gewog Data for Water, Sanitation and Waste.

Gewog	Latrine Facilities	Water Supply	HH with Functional Piped Water	HH with Animal Shed	HH with Garbage Pit	Waste Disposal Facilities
Mendrelgang	100%	100%	100%	80%	100%	The waste dumping site is at Riserboo Chiwog from where the garbage is collected on the first week of every month.
Barshong	99%	70%	70%	60%	40%	Every Village has a waste collection point.
Kilkhorthang	100%	100%	100%	20%	100%	Waste is gathered at the Chiwogs and transported to the Tsirang waste facility once a month.
Patshaling	100%	100%	85%	27%	68%	The supply of piped water is inadequate. Waste is disposed of at the nearest disposal pit.
Rangthangling	100%	100%	100%	80%	0%	The supply of piped water is inadequate. A Gewog-wide cleaning campaign is carried out on the first Saturday of every month with support from the Dzongkhag. The more remote villages manage the waste by themselves.
Tsholingkhar	100%	60%	80%	55%	90%	Waste is managed within each Chiwog. Each Chiwog has a collection pit, and the waste is transported to the Tsirang waste facility as and when the pit is filled to capacity.

Source: KII, Tsirang Dzongkhag Consultations (11th October 2023)

Photo 12 a-d. Existing municipal line tapping water from Kuchikhola

Photo 13 a-c. Existing water pipelines along the highway, overland or underground

Photo 14. Waste disposal site, Medrelgang

4.3.5. Education, Health, and Banking

Education: There are a total of 29 government educational facilities that are inclusive of 12 ECCD Centers, 1 Extended Classroom (ECR), 12 Primary Schools, 1 Middle Secondary School and 3 Central Schools. Additionally, there are 21 NFE Centres and one private Day Care. Details of education facilities are in Table 29.

Health: The district has 1 hospital with 50 beds manned by 6 doctors, 1 physiotherapist, 36 nurses, 34 technicians and 60 administration & support staff. The doctor to person ratio is 1:6908 while the nurse to person ratio is 1:690. There are 7 grade II BHU's and 25 outreach clinics are operational with a total of 18 health assistants and 36 village health workers. There are a total of 3 indigenous units with 2 indigenous physicians and 4 Sowa Menpas (Indigenous Medical Technicians). The district also has 3 ambulances[61].

Banking and Credit: Financial institution's services are available in the district including Bank of Bhutan (BOB), Bhutan National Bank (BNB), Royal Insurance Corporation of Bhutan (RICB), Bhutan Development Bank Limited (BDBL) and Bhutan Insurance Limited (BIL). Financial Institution Infrastructures include a branch office each for BOB, BNBL and BDBL along with an ATM facility for each. These are all located in Damphu Town[62].

Table 29.Education, Health and Banking Infrastructure and Services in the Six Gewogs.

Gewog	Educational Institutions	Health Facilities	Banking Services	Additional Information
Mendrelgang	1 PS 1 MSS 2 NFEs	1 BHU 1 ORC	1 BOB Agent	Additional health and banking services are availed from Damphu Town
Barshong	1 PS	1 BHU 1 Sub-post 1 ORC	BDBL services provided via the Community Centre	The Gewog Community Centre also provides ICT services
Kilkhorthang	1 PS 1 LSS 1 CS	1 General Hospital 1 ORC	1 BOB Branch Office + ATM 1 BNB Branch Office + ATM 1 BDBL Branch Office + ATM	The district general hospital is located here
Patshaling	1 PS 1 NFE	1 Sub-post *	RICBL services are provided through the Gewog Community Center	*Most general services are received from the Sub-post and the ORC in Mendrelgang Gewog while serious cases are referred to the Damphu Hospital in Kilkhorthang Gewog
Rangthangling	1 PS 1 ECR	2 ORCs **	1 BOB Agent 1 BNB Agent	** Most general services are received from the Sub-post while serious cases are referred to the Damphu Hospital in Kilkhorthang Gewog A Gewog Focal Person also visits once a month for health visits

[61] NSB, Annual Dzongkhag Statistics 2022 https://www.nsb.gov.bt/publications/annual-dzongkhag-statistics/

[62] NSB, Annual Dzongkhag Statistics 2022 https://www.nsb.gov.bt/publications/annual-dzongkhag-statistics/

Gewog	Educational Institutions	Health Facilities	Banking Services	Additional Information
Tsholingkhar	1 PS	1 ORC	1 BOB Agent	The PS was selected as a pilot school for New Approach to Primary Education (NAPE) Due to the proximity to Damphu town, all major health, education and banking services are also availed at Kilkhorthang Gewog

Source: KII, Tsirang Dzongkhag Consultations, 11th October 2023

4.3.6. Roads and Transportation

As of June 2023, the district is connected by 813.65 kms of roads inclusive of 61 kms of Primary National Highway, 2.30 kms of Secondary National Highway, 79.51 kms of Dzongkhag roads, 3.30 kms of Thromde roads, 646.23 kms of Farm roads, and 21.31 kms of Access roads. There has been an increase in the length of farm roads and Dzongkhag roads in comparison to 2019[63].

Table 30.Road Connectivity in the Six Gewogs.

Gewog	Highway Road	Dzongkhag Road	Farm Road	Forest Road	Feeder Road	GC Road	Total
Mendrelgang	0.5 km	0	32 km	0	0	11 km	43.5 km
Barshong	17 km	28 km	67 km	0	0	9.8 km	121.8 km
Kilkhorthang	1 km	6 km	44 km	0	2 km	1.43 km	54.43 km
Patshaling	5 km	10 km	36 km	2.5 km	0	0.52 km	54.02 km
Rangthangling	5 km	0	48.217 km	0	0.30	0	53.517 km
Tsholingkhar	30 km	20 km	40 km	0	8 km	0	98 km

Source: KII, Tsirang Dzongkhag Consultations (11th October 2023)

There will be no new access road constructed for the project. The project sites will be accessed through existing access roads and trails to the water source and reservoir areas. All construction materials will be manually hauled to the respective locations (source, reservoir, trench and worker camps)

4.3.7. Tourism

Apart from its welcoming climate and picturesque views, Tsirang doesn't offer much in terms of Tourist activities with limited tourism infrastructure and historical or cultural sites and most international visitors are those on official business. The number of Tourist visiting are very marginal with 68 arrivals in 2018, 74 in 2019, 6 in 2020 and 2 in 2021[64].

[63] DAG http://www.tsirang.gov.bt/embedded-files/tsirang-glance

[64] Tourism Council Statistics 2023,

4.3.8. Physical Cultural Resources

Tsirang Dzongkhag's tangible cultural infrastructure includes 2 Dzongs (fortresses/administrative centers of districts), 19 Lhakhangs (Buddhist temples) of which 5 government owned, 12 community owned and 2 privately owned, 36 Chortens (Buddhist stupas) and 3 archery grounds[65]. Of these, 6 Lhakhangs and 5 Chortens are located within beneficiary Chiwogs of Mendrelgang, Barshong, Kilkhorthang, Patshaling, Rangthangling and Tsholingkhar Gewogs. Additionally, there are a total of 6 Mandirs (Hindu temples) and various sacred sites (both Buddhist and Hindu) within the beneficiary Chiwogs of these six gewogs. More details are listed in the table below.

Table 31.Physical Cultural Resources in the Six Gewogs.

Gewog	Lhakhangs (Buddhist Temples)	Mandirs (Hindu Temples)	Chortens (Buddhist Stupas)	Sacred Sites (Hindu/Buddhist)
Mendrelgang	1	1	0	0
Barshong	1	2	0	0
Kilkhorthang	1	1	0	1 Nye
Patshaling	1	1	0	0
Rangthangling	1	1	2	Numerous Holy Stones
Tsholingkhar	1	0	3	1 Tshamkhang

Source: KII, Community Consultations 12th to 13th October 2023

All beneficiary chiwogs of the six gewogs have a Lhakhang each. Apart from Barshong's beneficiary chiwogs that have two Mandirs, each of these chiwogs also have a Mandir except for Tsholingkhar's beneficiary Chiwog which has none. Rangthangling and Tsholingkhar's beneficiary chiwogs have 2 and 3 chortens respectively. There is also a Sacred Site (Nye) in Kilkhorthang and a Tshamkhang (Meditation Site) in Tsholingkhar[66].

Photo 15. Lhakhang near Darchhangang Top under Rangthangling Gewog

[65] NSB, Annual Dzongkhag Statistics 2022 https://www.nsb.gov.bt/publications/annual-dzongkhag-statistics/

[66] KII, Community Consultations, Tsirang Dzongkhag, 12th to 13th October 2023

5. STAKEHOLDER IDENTIFICATION AND CONSULTATIONS

5.1. Background

The Stakeholder Engagement Plan (SEP) developed for the project serves as a management tool to guide stakeholder engagement during the whole project lifecycle, including targeted assessment process. The SEP identified four broad groups in the project area as shown in the table below.

Table 32.Project Stakeholders.

Direct Stakeholders	Indirect Stakeholders
Communities, specifically including farmers (both women and men) as well as vulnerable groups.	Research Agencies
Project Steering Committee especially the Department of Forest and Park Services, Department of Environment & Climate Change and the Department of Water under the Ministry of Energy and Natural Resources (MoENR), and the Ministry of Agriculture and Livestock (MoAL).	National NGOs/CSOs
Project Management Unit under MoIT	Multilateral Agencies
Project Implementation Unit	UNDP
Dzongkhag Administration	
Local Government	
Local agencies directly responsible for O&M of water infrastructure, agricultural extension, and forestry.	
Water Users' Associations, their committees, and other community-based organizations responsible for managing water resources and catchments and organizations of farmers.	
Entrepreneurs and private sector players involved in the O&M of water distribution networks.	

5.2. Stakeholder Mapping

For the Environmental and Social Impact Assessment these groups were classified into the following:

Direct Stakeholders. This includes

1. Individual households and the local communities. While these communities will be positively impacted by the project in terms of assured access to water for drinking and irrigation and may be potentially employed by the project, other members will be directly impacted by the project either permanently or temporarily. This may be through:

- temporary loss or potential loss in revenue (community forest group) if the timber cannot be extracted and sold,
- labor standards, salaries/wages and occupational health and safety risks (those employed by the contractor),
- risk of losing marginal potential cropping opportunity (for private landowners where trench work is carried out),
- temporary inconveniences/social disturbance due to the project construction activities (air, dust and noise pollution, excavation across access roads, sharing limited water with the contractor).

2. Disadvantaged and Vulnerable Groups Including **Women -** Households were considered as vulnerable if they belong to a) a household whose head of household is under the age of 18 or over 65; b) single-parent household run by a woman (either divorced or widowed), c) household living below the poverty-line i.e., with income less than Nu. 6,300 per person per month, d) a household that has persons that are impaired by a disability, d) a household that has only minors (under the age of 18) or elderly persons (over 65) with no income.

3. Project Steering Committee with members from Responsible Partner Agencies, the Department of Forest and Park Services and the Department of Water, and the Ministry of Agriculture and Livestock as these are responsible for implementing activities for watershed management and improved cropping practices.

4. Dzongkhag Administration and all the relevant sector heads responsible for ensuring sustainable development in the Dzongkhag (Dzongkhag Planning, Engineering, Environment, Land, Agriculture, Forest, Culture Officers).

5. Gewog Administration and local agencies involved in directly responsible for O&M of water infrastructure, agricultural extension, and forestry.

6. Water user groups

7. Entrepreneurs and private sector players involved in the O&M of water distribution networks.

Indirect Stakeholders

This includes interested individuals, groups, or organizations with an interest in the project, because of the project location, its characteristics, impacts, or matters related to public interest. This includes NGOs/CSOs, Multilateral agencies and UNDP.

5.3. Objective of the Stakeholder Consultations

To ensure environmentally sound and sustainable economic development and acceptability of the project and its potential impacts, consultations were conducted with stakeholders mentioned below to seek clarification on various aspects of the project design and layout, to fill in data gaps and to obtain their views.

UNDP – to share and seek the approval of the proposed ESIA, work schedule, seek project related information, seek clarity on the institutional framework for project management implementation, and supervision as well as seek assistance in planning the stakeholders consultations and site visits.

Other Stakeholders (Interested Parties)

Project Management Unit – to seek clarity on project components, project design (sustainability of project) and project implementation schedule.

Dzongkhag Planning Officer - to seek assistance in arranging the Dzongkhag and community consultations, discussions with relevant officers, site visits and access project related information (status of permits and clearances).

District Agriculture Officer - to seek information on the area of land under cultivation and possible potential land that will be brought under cultivation after the project.

District Engineer – to seek clarity on project components and project location, project beneficiaries and to determine the project area of influence, and discuss the alternatives considered to reduce anticipated impacts.

District Land Record Officer – to seek information on private plots that will be affected by the water distribution pipelines.

Community including WUA members and CF members – to share the project design and layout, schedule and share the Grievance Redress Mechanism as well as provide an opportunity for the community to voice their concerns and actively participate in the Environmental and Social Safeguard (ESS) planning process.

Dzongkhag Consultation - The main objective of the stakeholder consultation at the Dzongkhag was to disseminate information on the ESIA process, UNDP principles and standards, national regulatory requirements and the need to follow Free Prior and Informed Consent principles for inclusive planning and design of the interventions. The meeting provided an opportunity for the Dzongkhag and Gewog stakeholders to share their views and concerns or recommendations regarding any aspect of the project (design, layout, environmental and social impacts, project stakeholders, and the grievance redress mechanism). Dzongkhag support was solicited to fill in the gaps on information requirements to ensure a comprehensive targeted assessment and to better understand the existing human resources and capacity needs for successful implementation, supervision, and compliance monitoring of the ESMP during project implementation. Additionally, the consultations were also aimed at planning community consultations, and conducting Gender assessment to ensure Gender mainstreaming in the ESMP and the GRM. The views and recommendations have been taken into consideration and incorporated into the ESIA and ESMP.

Community Consultation - The main objective of the community consultation was to inform the community on the ESIA process, the project design and construction activities so that the relevant communities know what to expect during the construction process and how to report unanticipated impacts through the GRM.

The meeting also sought to provide an opportunity for beneficiaries, affected parties and vulnerable groups to share their views and concerns on the project and their input in developing appropriate mitigation measures. Additionally, the meeting provided an opportunity to seek information on the project area, water users' association and to validate the baseline information.

5.4. Consultation Approach and Participation

Prior information on the consultation including the date, venue and objectives was provided through the UNDP, Tsirang Dzongkhag and the Gewog Representatives who were requested to ensure that members of the vulnerable community were also invited to the consultation. The Gups in turn relayed the information through their social media channels to the beneficiaries, affected persons, and vulnerable groups.

The Dzongkhag Consultation held on 11th October 2023 began with an introductory session with the entire group of participants which was then divided into a) Gewog groups (one group per Gewog) including the Gup, GAO, Mangmi and Tshogpas; b) a Gender and Vulnerable Persons group; c) a Project group inclusive of the PMO, DE, FO and Agriculture Officer. The total number of participants is listed in Table 33. It was decided that the progressive Community Consultation would take place on 12th October 2023.

The Community Consultation was held on 12th October at Mendrelgang Gewog Centre. It was split into two group sessions, each comprising three gewogs represented per session. This was done to ensure a comprehensive method of inquiry and thorough information dissemination. During each session, subgroups for Gender and Vulnerable Persons were also created to encourage their participation and seek their views on the project. One group session was held in the morning and the other was held in the afternoon.

The Morning Session was attended by LG staff, representatives and community members inclusive of women and vulnerable persons from Kilkhorthang Gewog, Rangthangling Gewog and Tsholingkhar Gewog. Also in attendance were the District Engineers and the Dzongkhag Agriculture Officer. The session began with introductory presentations by the DE and the Consultant that culminated in a Q & A after which the attendees were divided into subgroups for their respective gewogs for community mapping activities with a separate group each created for Gender and Vulnerable Persons for Gender and vulnerability discussions. The total number of participants is listed in Table 33.

The afternoon session was attended by LG staff, representatives and community members inclusive of women and vulnerable persons from Barshong Gewog, Mendrelgang Gewog and Patshaling Gewog. Also in attendance were the District Engineers, the Dzongkhag Agriculture Officer, the Principal of Barshong Primary School and Staff from Mendrelgang Central School. The session began with introductory presentations by the DE and the Consultant that culminated in a Q & A after which the attendees were divided into subgroups for their respective gewogs for community mapping activities with a separate group each created for Gender and Vulnerable Persons for Gender and vulnerability discussions. The total number of participants is listed in Table 33.

In total, three public consultations were conducted from 11th to 13th October 2023. The number of participants is detailed in the table below.

Table 33. Details of Consultations.

Date and Time	Type of Consultation	Location	Participants	Male	Female	Total
11th October 2023 9 AM - 5 PM	District Level Consultation	Tsirang Dzongkhag	Dzongkhag Sectoral Heads, Local Government Representatives	38	12	50
11th October 2023 9.30 AM - 1 PM	Community Consultation	Mendrelgang Gewog	Dzongkhag Engineers, Dzongkhag Agriculture Officer, Local Government Staff, Representatives and Community Members from Tsholingkhar, Ranthangling and Kikorthang Gewogs, Staff from Bhutan Power Corporation	49	12	61
11th October 2023 2 PM - 5 PM	Community Consultation	Mendrelgang Gewog	Dzongkhag Engineers, Dzongkhag Agriculture Officer, Local Government Staff, Representatives and Community Members from Mendrelgang, Patshaling and Barshong Gewogs, Principal of Barshong Primary School, Staff of Mendrelgang Central School	45	14	59

The key comments and concerns received during the consultation were clarified and suggestions provided are included in the mitigation measures.

5.5. Summary of Consultations

The key comments, issues and recommendations raised during the consultation are summarized in the table below.

Table 34.Summary of Consultation at Tsirang Dzongkhag.

Concerns, Issues, and Recommendations	Clarification	Future Steps
Clarification was requested regarding the alignment to understand if the assurance provided from prior meetings for a provision of an outlet was incorporated into the design.	The provision for the agreed-upon outlet was confirmed by the District Engineer (DE) with reference to the presentation of the schematic diagram.	In the future, if required, Patshaling Gewog will make their own arrangements to extract the water from the provisioned outlet at the reservoir.
Impact on community forest in Patshaling gewog. The recently revised Forest and Nature Conservation Act, 2023, requires fair	Due diligence for this ACREWAS project has been carried out and individually signed consent by CF members has been obtained (April 22, 2022) PES, as compensation had been agreed upon	To ensure benefits to the CF in Patshaling Gewog, the outlet at the reservoir will be maintained.

Concerns, Issues, and Recommendations	Clarification	Future Steps
compensation as determined by the DoFPS to be paid to the Community Forest Management Group.	during previous consultations with the Gewog. The Project Officer mentioned that it was made clear during the inception meetings that the cap cannot be increased for Tsirang. If the compensation must be extracted from infrastructure component 3, then certain components will be impacted since there is a budget ceiling in place for infrastructure that has already been approved by the board during the infrastructure meeting. The Forest and Nature Conservation Act came into effect in 2023 whereas the discussion was held, and decisions were made in 2022. It was clarified by the local representatives that not every CF community affected is going to be a beneficiary of the PES which is only for the community where the water source is located.	
Status of clearances: - Environmental, Forestry and Community clearances have been obtained.	For the Tsirang-Sarpang Highway, clearance from the Department of Surface Transport will be required.	Seek clearance for installation of water pipelines across the highway.
Testing for water quality at source.	Water testing was carried out in June 2022. The baseline indicates higher than usual turbidity. The community was informed that the contractor will be required to ensure that water for domestic purposes will be tested and that water quality testing will be carried out during construction.	
New FCRs	Participants enquired about the probability of building new FCRs. It was clarified that existing FCRs are in good condition and budget constraints did not allow for new FCRs to be built. The existing FCRs will be supplied with water from the source.	

Concerns, Issues, and Recommendations	Clarification	Future Steps
Access Road	It was confirmed that there are no current plans or provisions for access roads. The materials will have to be manually carried and this has been budgeted accordingly.	
Community Consultations	It was decided that the community consultations would be conducted the following day in two batches with three gewogs each. Local Government representatives agreed to ensure that project beneficiaries, interested parties (school, BHU, BPC), affected households, Gender and vulnerable groups would be invited to attend the consultation.	
Grievance Redress Mechanism	There were no queries regarding this.	

Photo 16 a-b. Dzongkhag consultation 11/10/2023 at Tsirang dzong.

Table 35.Summary of Consultation with Kikorthang, Rangthangling, and Tsholingkhar Gewogs at Mendrelgang Gewog.

Concerns, issues, and recommendations	Clarification	Future steps
Concerns were raised regarding the pressure requirements along the ascent of slopes for upwards delivery of water. Concerns were also raised for probable damage/disruptions to existing private pipelines.	DE reassured the community that pressure breaks will be put in place to ensure the effective delivery of water. DE indicated that these can be realigned and connected to the Gewog supply at the FCR.	
By-laws Issues were mentioned regarding past and current situations where the water supply was subject to by-laws that referred to regulations that were specific to seasons. Currently, they have by-laws for water usage where the water supply is not integrated. For dry land, they have a seasonal rule and during harvest season, they stop the supply. They only provide the supply of irrigation water after harvest season. They have a different source for drinking water. Concerns were also raised regarding women's participation during consultations and meetings related to water use and interventions. As women here were either not attending or were unable to attend these meetings, they were often unaware of applicable by-laws with regard to tampering of the water source and specifically of pipes. Owing to their absence from these meetings and due to water shortage issues at hand, some women were resorting to cutting pipes to source and divert water for domestic and irrigation purposes.	The DE clarified that it is integrated, and the objective was to provide a 24-hour supply of water that could be used for both purposes. The optimal outputs would depend on collective responsibility and proper management as well as self-regulation and mindfulness of daily usage. An obligation for meaningful participation and promotion of an active understanding of the applicable by-laws for tampering of source or pipes must be incorporated by means of information dissemination and encouraging participation of women during consultation and meetings. The Consultant mentioned the by-laws should be reviewed and revised along with awareness raising and capacity building in relation to O & M.	New components to be integrated into existing by-laws by the gewogs.
Road widening of Wangduephodrang-Sarpang Highway was brought up in relation to possible implications to the alignment along the road.	DE mentioned that the road widening will take place in the future and that drinking water is the primary concern for now.	
There were concerns regarding the source since the municipal water is also drawn from the same source.	The consultant requested that proper E-Flow be maintained.	

Concerns, issues, and recommendations	Clarification	Future steps
The communities voiced their concern over the sustainability of the water source.	The DE assured that there wouldn't be implications on the water source and was asked to provide the validating data for the Municipality water source to complement this claim.	
One of the primary concerns is the pipeline for the alignment through the gewogs and the construction works involved which stressed on the fact that the Dzongkhag has the facilities, expendable budget, manpower, vehicles, services and expertise – which the Gewogs and Chiwogs were lacking in.	The Gup also rhetorically mentioned that it would be the Gewogs that would be face to face with the impacts, after the project is completed, the responsibility for use would be handed over to the Gewogs, therefore the communities must be mindful of their responsibilities since it will be in their hands to use, resolve and manage all aspects of the completed projects.	Integration of mindful usage and efficient management for supply and infrastructure to be implemented in relative by-laws by the communities.
Currently the decision-making process is male dominated. The women are the primary water users and therefore decision-making processes must encourage more female participation for the GRM component. The current process to address incidents of rape or domestic violence were either reported to RENEW or to the Police.	The consultant also mentioned that confidentiality needs to be maintained to avoid social stigma. The Tshogpa should also include women to address issues of Gender-based violence. All participants unanimously agreed that female representation would be required in a committee for GRM. RENEW comes along once a month to provide assistance and aid.	
Cultural Heritage	During the discussions for the community mapping exercise the participants provided information on the cultural heritage within the project area.	
Community Forest	The names and locations of the Community Forest areas were mapped during the community mapping exercise.	
Private Land	The District Agricultural Officer provided the details on the number of private land holdings that the pipeline would traverse.	

Photo 17 a-c. Community consultation on 12/10/2023, Morning Session.

Photo 18.Gewog wise Community Consultation- Tsholingkhar Gewog.

Photo 19. Gewog wise Community Consultation- Kilkhorthang Gewog.

Photo 20. Gewog wise Community Consultation- Rangthaling Gewog.

Photo 21. Vulnerable Group Consultation.

Table 36.Summary of Consultation with Barshong, Mendrelgang and Patshaling Gewogs at Mendrelgang Gewog.

Concerns, Issues, and Recommendations	Clarification	Future Steps
There are 2 lakes in Mendrelgang. There is a source pulled from Pao Khola for irrigation purposes leading to the FCR near the lakes. This dries out during dry seasons. The new supply may cause an overflow. The community requested outlets from the 2 lakes to provide water for vegetable irrigation alongside addition of another source at the water tank beside the lake. Also, the FCR tank is small and could be augmented.	The DE mentioned that it hasn't been long since the FCR was constructed and since the source is small, the tank is not usually filled completely. The assessment has been carried out and it has been determined that there are no leakages. Currently, augmentation of the existing FCRs is not possible due to budget constraints.	Proper description of the lake to be updated. In the future, if required, the Gewog will take responsibility to build a new tank or augment the existing one.
The communities showed concern over the size of the pipes and the trenches to be dug for them as this could lead to landslides for the households below the valley or on the lower levels if there are water leaks or excess use of water. There were also concerns over trenches being dug and filled simultaneously since open trenches would impose risks of accidents. The communities also voiced their concerns about the future prospects of road widening with the pipes being alongside the road which could lead to damage to the pipes or cancellation of the road widening works. Concerns were raised regarding the permanent structures that would be constructed for the alignment and how these might be implicated for other future projects.	The DE stated that digging would be done manually for minimal disturbance. The off seasons for agriculture would be the primary seasons for digging works. The DE also mentioned that the Terms would be incorporated into the Contractor's requirements for methods for the construction. The DE and the Consultant mentioned that any future project would also be subject to prior assessment and related mitigation. In this regard, the DE stated that alternatives for the location of the alignment were not possible.	The requirements for construction will be implemented in the Contractor's work plan.
There are members of the Tshogpa who are female, there may be women from the gewogs that are employed during the construction phase as well.	With a strong female representation, any concerns related to GRM can be addressed better when it comes to any Gender-based issues that may arise. RENEW has also provided awareness workshops recently.	
Landscape of Patshaling was brought up concerning the pipelines.	The DE clarified that all trenching works will be carried out manually. They have taken the landscape into consideration and incorporated measures to have minimal disturbances during construction.	

Photo 22 a-b. Community consultation on 12/10/2023, Afternoon Session.

Photo 23. Gewog wise Community Consultation- Patshaling Gewog.

Photo 24. Gewog wise Community Consultation- Barshong Gewog.

Photo 25. Gewog wise Community Consultation- Mendrelgang Gewog.

Photo 26. Vulnerable Group Consultation.

6. ANALYSIS OF ALTERNATIVES

6.1. Alternative Selection

The climate-proof integrated domestic and irrigation water supply has been selected based on the existing water sources, social, environmental, and economic considerations. The table in the subsequent sections details the analysis of alternatives in terms of their potential social and environmental impacts, and the cost of alternative mitigation measures.

6.1.1. The Do Nothing Alternative

Most environmental concerns in project sites arise from climate change related extreme rain events that trigger floods, erosion and occasionally mud-slips and landslides and cause damage to existing water infrastructure. Without the project, the communities in the 6 gewogs will continue to face acute shortage of drinking water especially during the winter months (dry season) with little financial support to mitigate these impacts or restore damaged or worn-out infrastructure. Therefore, maintaining the status quo is not a viable option.

6.1.2. Alternatives Relating to Source.

There are no alternatives to the source as the Khuchi Khola is the only nearest water source that can cater to the water demand for the six gewogs. This source is also only currently tapped to cater to the municipality and there are no downstream users.

6.1.3. Alternatives Relating to Selection of Alignment

Alternatives to the selected water pipeline alignment was to route the water alignment along the shortest route possible but this is not feasible due to terrain, water pressure and gradient.

Also, avoidance of impacts to forest (state reserve forest and community forest) is unavoidable as forest coverage is over 87% in the district. The water sources are inside the Biological Corridor 3 but moving them further downstream will have implications on the design and waterflow. Hence, the alignment was accordingly selected after assessing all the mentioned factors.

6.1.4. Alternatives in terms of Design and Technology

The selected design is an upgradation of the existing water supply scheme into an integrated system that will serve domestic and irrigation water. A provision for an outlet at the intake for possible supply of water to Pangthang Chiwog in Patshaling Gewog has been left so that the water can be tapped at a later stage in case the need arises. Designing an entirely new water supply system for the six gewogs will entail enormous capital costs and wastage of existing facilities. The current design will utilize existing reservoir tanks that are underutilized due to inadequate water.

DI pipes were chosen to resist high pressure due to the irregularity of the terrain and resist minor landslides. These pipes are more climate resilient than regular pipes. Trenching allows for the proper functioning of the water pipe by supporting the weight of the pipes and keeping them in place. Also, water loss through illegal tapping will be minimized as these cannot be seen easily or tampered with. Laying of pipes overland will expose the pipes to climatic conditions and risk damage caused by people or due to natural hazards.

According to the cost benefit analysis conducted for the project, without this investment, the project infrastructure is estimated to last up to 15 years but with the investment in climate-proofing, the project infrastructure has a lifespan of 70 years. This projection includes 5 years of the implementation period (including 2 years of the construction period). Project's benefits will start from the third year.

The population projection is for 30 years, which means that after 30 years, if the population increases, then either alternative sources will have to be explored or the design altered to accommodate the increase in water demand.

7. SOCIAL AND ENVIRONMENTAL RISKS AND IMPACTS

7.1. Preconstruction

7.1.1. Project Design- Selection of Water Source and Water Abstraction

Currently, some of the water from the Khuchi Khola stream is being tapped to supply drinking water to Tsirang town and its surrounding area (3.12 lps). The current water yield during the lean season is 81.91 lps of which the project will abstract 58 lps. This is based on the projected demand for drinking and irrigation as per the population projection of 30 years.

The project will provide assured access to communities dependent on small streams from sustainable water source, through soil conservation and erosion control structures along water conveyance lines, protective walls around water off takes and fencing and vegetative/bio-engineering measures around reservoirs under Component 2 of the project. Participatory water resource will be conducted to develop watershed development plans for implementation by local institutions and Dzongkhag Water Masterplans for the project Dzongkhags and River Basin Management Plan for Punatsangchhu river basin. This will facilitate the adoption of integrated approaches to water resource governance and management and enable water security as well as disaster and climate change resilience at both Dzongkhag and basin levels.

To improve resilience, sustainability, and quality of water service delivery, the project will strengthen water governance, and provide institutional and community level capacity for climate-smart water and watershed management. These activities will be conducted in parallel to the construction work so that by the time the infrastructure is completed, the required governance, institutional arrangements, and capacities to take over the operation and management of the scheme, is in place.

However, water availability in rivers and streams in Bhutan is highly variable depending on the season and lowest during the lean season.

Mitigation Measures: The project must ensure the following:

- Ensure that source sustainability analysis has been undertaken to determine the appropriate withdrawal rate from the water source keeping in mind current water abstraction and future population and demand projections.
- Ensure water discharge measurements are also taken during the lean season to understand the lowest flow. This can be undertaken as part of preparation of the local forest/watershed management activity, which is planned under activity 2.1.3 or under output 4.2 of the Project wherein a framework and Standard Operating Procedure (SoP) for regular reporting and sharing of data and reports on the state of river basin will be put in place to track and document water quality, quantity, availability, assets, and inventory.

- Ensure that, as required by the Water Act 2011 and the Water Regulation of Bhutan 2014, 30% environmental flow is maintained in the streams for ecological purposes for all times by monitoring the same.

- Ensure that the Gewog is included in the activities listed under other components of the ACREWAS project.

7.1.2. Impact on Aquatic Ecosystems and Ecosystem Functionality

As per the Water Act 2011 and the Water Regulation Act 2014, a minimum of 30% environmental flow to be maintained in a watercourse to sustain water ecology and aquatic biodiversity. Given the total water demand, only 30% of the water from the stream will be diverted. Additionally, the streams below the water source will also contribute to the watercourse.

Mitigation measure: The PMU must collaborate with the Department of Forest and Park Services to prepare Watershed Management Plan and implement conservation measures prior to construction. This includes conducting assessments and community consultations to understand the current socio-economic and land use, watershed conditions, identify and quantity threats to the water source and identify measures for watershed conservation in collaboration with the community and local government.

7.1.3. Protected Areas, Forest and Biodiversity

The two water sources in Patshaling Gewog lie within Biological Corridor 3 and 0.6 km of the main water pipeline will traverse the Biological Corridor 3 (BC3) at two places (0.6 km from the water source 1, and 0.4 km from the water source 2). As the major portion of the project infrastructure is within state forest land and community forest, the construction activities will cause forest fragmentation, causing habitat alteration and impact species that rely on forest habits for food, shelter, and breeding, especially those that are already endangered, vulnerable or near threatened.

Mitigation measures: A baseline and monitoring are critical in evaluating the impact of construction activities on forest cover and biodiversity. The baseline serves as a reference point for measuring changes and quantifying alterations and monitoring forest cover and biodiversity is vital for understanding ecosystem impacts, assessing trends, and identifying conservation measures.

- The PMU and the Department of Forest and Park Services should collaborate on conducting biodiversity surveys before and after construction activities to better understand the construction impact.
- Implement the Biodiversity Action Plan in collaboration with DOFPS.
- The contractor must ensure that only those trees marked are cut and avoid or minimize cutting of trees to establish contractor facilities and avoid or minimize damaging trees during transportation as much as possible

7.1.4. Consents and Permits and Clearance Requirements

Environmental Clearance is required for construction of the project infrastructure. The consent to construct reservoirs, break pressure tanks and trenches within the community forest is required from the two Community Forest Management Groups, while the consent for tree felling is required from the Department of Forest and Park Services. Where the distribution pipelines traverse private land, the consent of private landholders is required.

The Environmental Clearance, Forest Clearance, consent from the two Community Forest Management Groups and from the community, including private landholders, have all been obtained and are attached in Annexes 3-6. The project must ensure that consent from private landowners includes those from absentee owners as well as new landowners (where land has been recently sold), to avoid delays or expose the construction activities.

As the Environmental Clearance is only valid until March 2024, the project must process for renewal of the EC one month before the expiry date. If there are major changes in the project design resulting in an increase in the forest area to be cleared, then the project must reapply for forest clearance for the additional land area.

7.1.5. Project Disclosure and Information Sharing

The project has ensured Prior and Informed Consent (protocols were followed during project design to ensure communities, including women, vulnerable groups as well as socio-cultural groups, participate in the project by their own free will and the same was followed for the targeted assessment. However, there is still the risk that despite this, because women are the primary caregivers (especially for the young children and old parents), homemakers and are busy with farmwork, they do not have the time to attend all consultations. Also, there is the risk that persons with disabilities would face challenges with accessibility to attend the consultations as easily as the rest of the community and would have to rely on second-hand information.

During the public consultation, out of 120 attendees, there were 24 vulnerable persons in attendance, for which a separate focus group discussion was held. However, aside from one person with walking disability, and a parent of an autistic child, the participation of vulnerable persons were mostly the elderly, divorced/widowed/single-parent women and retired persons with no income. There is a risk of other marginalized and vulnerable groups not having access to primary information about project activities and having to rely on secondary information delivery that may possibly be distorted or incomplete.

Mitigation measures: The PIU and the Gewog must ensure the following:

- Follow and implement the Stakeholder Engagement Plan.
- Ensure active representation and participation of women and vulnerable groups at all stages of the project.
- Disseminate information on the Grievance Redressal Mechanism developed for the Project on the MoIT website, official notification on the GRM committees and through Local Government (notification and social media chat groups).

7.1.6. Contractor Selection, Cost Estimation and Bidding Process

While most contractors are aware of the bidding process, there is a risk that contractors may overlook ESMP requirements, leading to non-budgeting of mitigation measures in contracts, and they may not be aware of applicable UNDP and RGOB laws or environmental and social safeguard application.

Mitigation measures: The PMU must ensure the following:

- That the ESMP is included in the contract documents.
- Ensure that the bidding and contract documents include specific provisions requiring Contractors to comply with all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; on (b) equal pay for equal work of equal value regardless of Gender, ethnicity or caste; and on (c) elimination of forced labor; and the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites; as well as comply with applicable environmental and forestry laws and regulations.
- Conduct a pre-bid meeting with the Contractor to inform or brief them on relevant policies, standards and safeguard measures as outlined in the ESMP, that must be incorporated into the Contractor's cost including the Code of Conduct
- After the contract is awarded, conduct contractor orientation on Environmental and Social Safeguard measures. During the orientation, ensure that topics such as relevant national laws and regulations, chance find procedure, GRM, compliance with EC and FC, Environment and Social Management Plans, contractor self-monitoring and report, and water testing to ensure safe drinking water for workers are covered.

7.2. Construction Phase

7.2.1. Quality Control and Environmental and Social Safeguard Monitoring During Construction

Substandard materials and services in construction projects can lead to safety hazards, financial losses, delays, and compromised structural integrity, posing significant risks. Therefore, quality control requires systematic processes to ensure that the required standards are met and to ensure the sustainability of the water infrastructure.

Mitigation measures: Under the Quality Assurance Plan, the PMU must form the Quality Control Team and conduct training for Contractor and PIU staff on quality and Quality Assurance to ensure use of standard materials, construction quality, safety, and compliance.

The Contractor is responsible for quality assurance, sourcing materials, testing them, and submitting the results to the Quality Control Team.

The PMU must ensure the Contractor is fully responsible for supplying standard, quality materials in accordance with the specifications outlined in the bidding documents.

7.2.2. Compliance Monitoring and Effectiveness of Mitigation Measures

Environmental and social safeguard monitoring is critical to ensure that regulations, permits, and social responsibilities are followed, and to identify potential issues early, enabling timely corrective actions, and minimizing negative consequences.

Mitigation measures: The PMU must ensure the following:

- Environmental and Social Safeguards compliance monitoring and review ESS reports.
- Monitor the implementation of the ESMP and Management Plans onsite by the Contractor
- Continuously review the effectiveness of mitigation measures and make necessary adjustments based on community feedback and evolving needs.

7.2.3. Recruitment of Workers and OHS

The project will involve the mobilization of a Contractor, his employees (nationals) and recruitment of several workers especially during peak construction period. The construction will involve both skilled and semi-skilled workers from outside the country, from the Dzongkhag as well as from within the gewogs.
There will also be transporters and material suppliers. Some of the risks associated with recruitment of workers are recruitment of underage workers, Gender discrimination, worker payments, and potential health and safety impacts for employees due to inadequate accommodation or unclean sanitation facilities, unsafe working conditions and lack of PPE.

Mitigation measures: The PMU must ensure that bidding and contract documents include specific provisions requiring contractors to comply with all applicable labour laws and core labour standards on (a) prohibition of child labour as defined in national legislation for construction and maintenance activities; on (b) equal pay for equal work of equal value regardless of Gender, ethnicity or caste; on (c) elimination of forced labour; and on (d) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites.

The PMU should also encourage the Contractor to provide work opportunities to the unemployed persons within the beneficiary gewogs during the pre-bid consultation.

The Contractor will be required to ensure the following:

- Provide workers with good quality temporary accommodation, with ample and safe drinking water, electricity and sanitation facilities with separate toilets for females. Worker camps will be self-contained, regularly cleaned and properly organized to handle waste issues as per the waste management plan.
- That adequate budget is allocated for provision of the required PPE for workers, well stocked first aid at all work sites and for emergency transportation in case of accidents at the worksite or camps.
- Compliance with the requirements of the national legislation on recruitment, management and health and safety of all workers and the Labour Management Plan.
- Nominate an Environmental Health and Safety Focal Person (or equivalent) who will have the overall responsibility to ensure safe working conditions and environment for all workers.
- Provide the required PPE for workers and ensure that workers use these.
- Provide guidance on the appropriate material haulage method, excavation and construction procedures and that workers should not be forced to work during risky weather conditions.
- Conduct orientation/induction for new workers wherein workers are briefed on working procedures, health, safety, required social behavior, maintenance of worker camps, and

restrictions on illegal activities in the forest, including work hours, weekly offs, wages, overtime work and wages, Grievance Redressal mechanism etc.
- Maintain a well-stocked first aid kit on site and maintain records of all accidents including measures taken.
- Provide immediate transportation to the nearest health facility for workers if required.
- Provide adequate compensation to workers in case of temporary or permanent disablement or death due to work-related accidents.
- Put in place a workplace Emergency Preparedness and Action Plan and brief workers on the plan.

The Contractor must also ensure the following to address worker conflicts and grievances:
- Ensure workers comply with the Code of Conduct.
- Prohibit drinking or the consumption of any type of drugs/intoxicant during working hours.
- Resolve any conflicts between workers and impose sanctions for inappropriate conduct.
- Establish a mechanism for workers to express their grievances.

7.2.4. Community Health and Safety- Impacts Due to Influx of Workers

The influx of foreign workers may cause social conflicts and social exploitation. Additionally, foreign workers may spread communicable diseases like HIV/AIDS and there is also the risk of GBV. Siting of worker camps will also impact the quality of the immediate physical environment and disturb residents in the immediate vicinity.

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Mitigation Measure. To minimize the impact on the adjacent community, the contractor should ensure the following:

- Ensure foreign workers are screened for communicable diseases such as HIV/AIDs, Malaria and Dengue prior to arrival at the site.
- Brief all workers on required social behavior and impose sanctions for inappropriate conduct.
- Provide training on GBVH to workers during the Induction Training.
- Ensure workers follow the Code of Conduct.
- Follow the GRM process and record grievances/complaints received from the public and actions taken.
- The Contractor is to identify an area away from the community and water bodies to set up the Workers Camp.
- The Worker Camp once set up is to have adequate sanitary facilities and soak pits. All discharge of water from kitchen, bathing and washing should be directed to the soak pit and the Contractor should ensure that no discharge is done in the drains and water bodies used by the community.

7.2.5. Lack of Opportunities for Women, Youth and Vulnerable Groups

The PPG process has ensured that Gender elements have been considered in the project design through the project Gender analysis and preparation of the Gender Action Plan that incorporates measures to minimize/mitigate adverse Gender impacts. The provision of drinking water addresses Gender responsive activities. Gender experts have been engaged in conducting expert assessments and conducting consultations with women.

The project's positive impacts significantly outweigh any associated risks and adverse effects on the community, and these sentiments are consistently expressed in the FGDs. A significant positive outcome of the project is the rejuvenation of 48.1 acres of previously unused land through irrigation water supply. This initiative will also significantly alleviate the issue of domestic water scarcity.

When engaging with the community through Focus Group Discussions (FGDs), it was revealed that there had been limited Gender equality campaigns in the past specifically aimed at community leaders. Despite these efforts, it was observed that there are knowledge and capacity gaps among the leaders in terms of fully understanding and effectively promoting Gender equality. Addressing these capacity gaps is essential to ensure that community leaders play an active and informed role in advancing Gender equality initiatives.

In general, waterborne and sanitation-related diseases are remembered as issues of the past, prevalent in the early 1990s. However, concerns about such diseases persist among women in the community.

While there appears to be an effort to seek equal consent from women in decision-making, there is no robust mechanism in place to effectively capture and address the specific concerns and needs of women. Men tend to hold the ultimate decision-making authority, and women's representation in these processes is notably limited. This imbalance could lead to the oversight of the unique concerns and requirements of women and girls. Furthermore, the low attendance of women in general meetings exacerbates the Gender equality situation.

While certain sectors have shown advancements in Gender equality, persisting challenges are evident across multiple domains. The intersection of water and Gender becomes notably pronounced, especially in comparison to men. This is largely attributed to women's multifaceted roles as caregivers, cooks, and homemakers, all of which are intricately linked to their access to water resources. Additionally, the ongoing trend of feminization in agriculture has heightened women's reliance on water resources. In numerous cases, men have ventured away from their communities in search of more financially rewarding employment opportunities, thereby placing the agricultural responsibilities squarely on the shoulders of women.

The influx of both foreign and national workers from other areas may raise concerns about an increased risk of Gender-Based Violence (GBV), despite the absence of official records of such incidents in the community. Moreover, the additional population could strain the already acute water shortage. The deployment of a temporary water supply to meet the heightened demand for water may also pose potential risks to the water quality.

As the project is expected to generate job opportunities in its sub-activities, there's a concern about Gender bias in recruitment due to the traditional perception favoring men in manual labor. This belief also contributes to wage disparities.

Measures for Youth and Vulnerable Persons.

- During the pre-bid consultation, the PMU should encourage the contractor to provide work opportunities to unemployed youth in the beneficiary gewogs to ensure representation and participation of youth and vulnerable groups[67] at all stages of the project.
- Follow and implement the Stakeholder Engagement Plan.
- Disseminate information on the Grievance Redressal Mechanism developed for the Project through the MoIT website, official notification, and local government channels (notification and social media chat groups).

Measures for Gender Mainstreaming.

To tackle these Gender-related concerns in the project, a Gender-responsive approach is imperative. This approach entails considering the varied needs, roles, and viewpoints of different genders within the community. It also actively involves women in decision-making processes and ensures that project designs empower all community members while diminishing Gender inequalities in accessing clean water and sanitation. Potential mitigation measures encompass:

- To increase women's involvement in decision-making, it is advised to conduct leadership and women's empowerment training for the women in the community while also extending the awareness programmes on importance of Gender equality to both men and women in the community. Encouraging women to take leadership roles in community organizations, including water management committees, and offer training to enhance their leadership skills. Schedule meetings at times and locations that are convenient for women. Consider policies that reserve a portion of decision-making positions for women. Sensitize men and community leaders to the benefits of women's participation and seek their support. Regularly assess the effectiveness of these measures and adjust with progressive mitigation measures based on community feedback and changing needs. Providing digital literacy programs in the communities can also empower women to participate in online meetings.

- Organizing GBV awareness and prevention training for all project workers, emphasizing respect with zero tolerance for GBV. This helps reduce GBV risks from both foreign and national workers. Collaborate with existing NGOs like RENEW and Tarayana to enhance local support services and further mitigate GBV risks.

- The project is expected to have an influx of project workers in the community during the project implementation period that would result in the increased demand for water. Given that there is already a shortage of water in the community, the project workers or community members might resort to a temporary water sources including fetching of water from any available sources without considering health risks. Additionally, the makeshift water supply might be exposed to external contamination, even if the water itself is safe at the source. To minimize the risk of water contamination and related waterborne diseases, it's crucial to involve the community in monitoring and maintaining the system. Set up clear ways for reporting water quality concerns and seek advice from local health centers such as PHCs (Public Health Centers) and hospitals to ensure a safe water supply

[67] Marginalized/vulnerable groups include the elderly, people with disabilities, landless poor and youth, as well as minority groups who may face social and economic exclusion

for the communities where possible. Encourage proper water handling and storage practices among the water users including both the community members and the project workers.

- Adopt a Gender-friendly approach in the recruitment process that promotes and ensures Gender equality and fairness. All recruitment processes should aim to provide equal opportunities for both men and women to access employment and job roles within the project's sub-activities. Furthermore, it is also equally important to implement policies and practices that ensure equal pay for equal work, regardless of Gender.

- The presence of a woman as a women representative in the GRM committee must be ensured to promote easy access and confidentiality in GBV cases.

GRM Measures for Gender Based Violence/Sexual Exploitation, Abuse and Harassment.

The project will comply with the UNDP 'Strategy and Action Plan on response to sexual harassment and sexual exploitation and abuse (2023-2024)'. The strategy will address SH and SEA through prevention, reporting, response, victim/survivor-centered approach, and accountability.

The project will work towards the prevention of such cases through awareness raising about SH and SEA, expected standards of conduct, prohibited conduct, mechanism for reporting and available support options. Training for local government and community members will be tailored, as appropriate, to local contexts and culture to ensure maximum effectiveness. Trainings will also cover root causes of harassment and abuse, long-standing power imbalances and multiple and intersecting forms of discrimination (including issues like sexism, homophobia, racism and ageism).

PMU, PIU and the contractor will ensure zero tolerance for all kinds of sexual misconduct, and ensure that all incidences of SH and SEA are addressed quickly and effectively, while protecting the victim/survivors and ensuring confidentiality of victims and accountability of the perpetrators Withing the gewog, a focal person/community volunteer must be identified, trained, and required to abide by the SEAH protocol as well as the National SOP for GBV Prevention prepared by the National Commission for Women and Children (NCWC). The SOP is especially relevant for locations where specialized GBV services are not available or accessible.

The focal person must provide a safe atmosphere/space and serve as a confidential resource for all persons experiencing any form of harassment, discrimination, and abuse of authority. The focal person must inform the community and ensure that all people understand the support options available to them.

As per the national SOP, the focal person/community volunteers must be aware of the types of community and GBV specialized services that are available in their area and provide this information and support the survivor to access these services in line with their wishes including arranging safe transportation. In case a survivor shares any information, the focal person must follow full confidentiality as per the SOP and not coerce the survivor into making any immediate decision. Informed consent is an ongoing process wherein a survivor may retract their consent and may also refuse to receive support or services. Reporting of GBV cases is not mandatory at the first stage, especially as it violates the survivor centred approach, and places the survivor at risk.

The focal person's responsibility is complete once the survivor is linked to a helpline or case manager of a service provider such as the Dzongkhag Legal Officer, CSO and NCWC.

7.2.6. Forest Clearance and Impacts on Biodiversity

To reduce the impacts on forest cover and biodiversity during the construction period, the PMU must ensure the following:

- Ensure compliance with the Environmental Clearance and the Forestry Clearance from the Department of Forest and Park Services. Ensure that the EC and FC are shared with the Contractor.
- Ensure that adequate budget to pay the Royalty for the felling of trees to the Department of Forest and Park Services is incorporated into the project cost.
- Implement the Biodiversity Action Plan developed for the Project.

The Contractor must ensure the following:

- Ensure that only those trees marked are cut and avoid or minimize cutting of trees to establish contractor facilities and avoid or minimize damaging trees during tree cutting and transportation as much as possible.
- Brief all workers on Forest and Nature Conservation rules and penalties governing illegal felling of trees, poaching, setting forest fires and indiscriminate waste disposal in forest areas.
- Avoid using firewood for cooking in the worker camps through provision of gas or electricity for cooking. Maintain fire extinguishers or adequate water pipes, tanks, buckets etc. at worker camps inside the forest as a precautionary measure.
- Ensure workers are briefed on fire hazards and trained to deal with such hazards.
- The Contractors will be fully liable for any damage caused due to fire caused by construction activities/workers.
- Adopt environment friendly construction techniques[68] to ensure minimal damage to the surrounding.
- Develop a Spoil Management Plan (SMP) to ensure proper disposal of excess excavated materials, which include minimizing haulage and disposal of excess soils, and reuse excess soils for beneficial purposes such as raising the level of low-lying areas.

7.2.7. Impact due to Increase in Traffic due to Material Transportation.

Material transport and storage will involve mobilization of trucks, construction equipment and storage space. This activity will generate noise, vehicle emission and dust during transport and unloading (and storage) that could affect all receptors surrounding the project sites. As the access road to the gewog is quite narrow, there is also the risk of accidents during material transportation.

[68] Environmentally friendly construction techniques include manual digging, limit excavation to the required trench width, reuse of excavated material for trench backfilling, undertake pipelaying and cover the trench as soon as possible and stabilize the soil to prevent soil erosion, use erosion control measures to reduce soil erosion, slope stabilization along erosion prone areas, construction of side drains to prevent flooding, use of bioengineering to stabilize slopes and restricting dumping of soil in streams.

Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality. However, there are not many settlements along the access road, so the risk of constant exposure to vehicle emission is minimal.

Mitigation: The contractor must ensure the following:

- Identify adequate space for parking of construction equipment and vehicles and avoid material storage along roadsides. All stockpiles that will be left idle for a long time must be covered.
- Cover vehicles transporting sand, soil, and aggregates with tarpaulin to reduce the release of dust along transport routes.
- Spray dusty areas with water to reduce dust emission.
- Ensure regular maintenance of equipment to prevent smoke belching and compliance with the RSTA emission test.
- All licensed drivers must follow the required speed limits
- Avoidance of working at night to curb noise emissions.
- Transportation vehicles must install back sirens to alert workers or public when the vehicle is moving.

7.2.8. Construction Work at the Sources and near Streams

Construction activities, including blasting, excavation, and soil disturbance and dumping, can lead to increased sediment runoff into streams, compromising water quality, especially near stream banks and may also clog the water course.

Construction camp runoff can contain pollutants from sewage, chemicals, and waste that will pollute the aquatic ecosystem.

Mitigation: The construction of gabion walls upstream of the intake is proposed to prevent debris from being disposed of into the stream during monsoon seasons. The contractor must ensure the following:

- Ensure that debris from the construction of gabion walls proposed upstream of the intake to block debris during monsoon seasons is not disposed of into the stream.
- Conduct water quality monitoring once every quarter during the entire construction period
- Maintain at least 15 m distance between worker camps and material storage from the stream.
- Follow waste management plan and ensure all waste is removed from the site when shifting worker camps.
- Adopt environment friendly construction techniques[69] to ensure minimal damage to the surroundings and the stream.

[69] Environmentally friendly construction techniques include manual digging, limit excavation to the required trench width, reuse of excavated material for trench backfilling, undertake pipelaying and cover the trench as soon as possible and stabilize the soil to prevent soil erosion, use erosion control measures to reduce soil erosion, slope stabilization along erosion prone areas, construction of side drains to prevent flooding, use of bioengineering to stabilize slopes and restricting dumping of soil in streams.

- Restrict release of effluent from the worker camps directly into the stream by directing the sewage into soakpits.
- Ensure that all waste (non-Hazardous and Hazardous) are duly stored in demarcated areas within the project site and adequately transported and disposed of at designated waste disposal areas identified by the Gewog.

7.2.9. Blasting

Blasting will disturb wildlife and communities due to the noise and vibration. The dust, fumes and rockfall may also be a hazard to workers (and the community) and increase the potential for landslides in the surrounding area with unintended consequences on the stability of the terrain.

Mitigation measures: The contractor must ensure the following:

- Follow silent/controlled blasting techniques that minimize vibration and rock fragmentation.
- Comply with the Explosives Rules 1989 in terms of permits, procurement, transportation, storage, security personnel, safety precautions, maintenance of records and blasting procedures. This includes ensuring that a competent person/blaster with a shotfirer's certificate and experience in preparing and carrying out blasting work is utilized.
- Ensure the safety of all blasters through proper provisioning of the requisite PPE.
- Ensure the safety of other workers during blasting operation through use of warning signs and audible signals before the commencement of blasting.
- Report any loss or theft of explosives immediately to the permit issuing authority and to the nearest police station.
- Immediately remove all remaining explosives from the site upon completion of blasting.
- Prepare Emergency Preparedness and Response Plan and follow emergency procedures to evacuate injured persons immediately to a health facility in case of accidents.
- Inform the community when the blasting work is going to commence so that all are aware about this and place an alarm prior to blasting work.
- Ensure that adequate safety and time (of blasting) signages are displayed in local languages at the site area.

7.2.10. Excavation of Trenches and Pipelaying in Settlements and Farmland

Where trenches are excavated in areas commonly accessed by community people, there may be the risk of passersby or children falling into the trenches (especially at night). Other impacts from excavation work include generation of dust and issues with blockage of pathways if excavated materials are not stored safely and neatly.

Mitigation measures: Disseminate Information on the GRM developed for the Project including contact details of the nominated Grievance Officer. The use of local dialect for ease of communication is recommended.

The contractor must ensure the following:

- Ensure that prior information is given to all community members via the local government regarding commencement of the construction activities.

- The contractor must schedule and ensure that excavation of trenches ahead of pipe laying and backfilling must be efficiently scheduled during winter months and minimize the period from the time of opening a trench to backfilling (unless there are exceptional circumstances agreed between the Contractors and PIU warranting a longer period). These measures must be included in the terms and conditions of the Contractors' Contractual Agreements.
- Wherever possible, pipes should be laid as soon as possible, and trenches closed up promptly to reduce safety risks and dust generation.
- Ensure that the consent of community members is sought by the contractor when selecting sites for locating constructor facilities (site office, storage sheds and worker camps) if these are located within the settlement area.
- Restrict any excavation on sites of cultural significance unless written consent is provided by the socio-cultural group.
- Avoid organizing meetings and training during festivals or occasions when the community is occupied with their traditional/cultural activities.
- Adopt an inclusive approach and ensure that no community or groups with a distinct dialect, traditional beliefs and customs is left out or impacted negatively by the project.
- Ensure that all trenches once excavated is cordoned off with hard and soft barricades
- Ensure that pathways commonly used by the local community are not restricted with construction materials and equipment.
- Ensure that adequate safety signages are displayed along the excavated trenches.

7.2.11. Religious and Cultural Sites and Religious Practices

Field visits revealed no cultural heritage sites or properties near surveyed sites or pipe alignments. In an unlikely event that artifacts or archaeological resources are encountered during the excavation, the onsite chance find procedure must be followed. The chance find procedures are detailed in section 11.5 under Chapter 11.

Construction work in settlement areas will not disrupt religious festivals or prayers if these are carried out near the religious sites such as Mandirs and Lhakhangs. However, if prayers and celebrations are conducted on open ground, there is the risk that noise from excavation work could disrupt these practices.

Mitigation measures: The PIU must ensure the following:

- Restrict any excavation on sites of cultural significance unless written consent is provided by the socio-cultural group.
- Avoid organizing meetings and training during festivals or occasions when the community is occupied with their traditional/cultural activities.
- Adopt an inclusive approach and ensure that no community or groups with a distinct dialect, traditional beliefs and customs is left out or impacted negatively by the project.
- Use local dialect for ease of communication.
- Disseminate information on the GRM developed for the Project including contact details of the nominated Grievance Officer.

The contractor must consult the Gup to ascertain religious festival days, be mindful of the religious practices and halt any work that might cause disturbances or inconveniences to the community at least for the duration of the festival/prayers or celebration.

Where artifacts or archaeological resources are encountered during the excavation, the onsite chance find procedure must be followed.

7.2.12. Damage During Construction or Material Transportation

While it is not anticipated, there is always the risk that government or private property may be damaged during construction or material transportation.

Mitigation measure: The contractor must repair any damage to government or private property at the contractor's own cost.

Information on GRM is to be disseminated to the local community including the contact details of the GRM focal point.

7.2.13. Soil Erosion and Landslides

Some sections of the water pipeline alignment fall on moderate to steep slopes (between 35-40 degrees). These have been incorporated into the project design and in such areas the water pipes will be supported with pipe support pillars and retaining walls. However, if these are not adequately constructed, there is a risk that pipes may be damaged, and leakages may trigger soil erosion or even landslides.

The water from the distribution chamber for irrigation will be fed into existing smaller streams/gullies to mitigate against damage to existing farmlands. This is to minimize the impact of soil erosion on farmland.

Mitigation measures: The control of surface runoff is necessary in preventing erosion and landslides. It is critical that the PIU conducts monthly monitoring of the works being carried out on steep slopes to ensure that structures on steep cliffs are stable and that soil is not indiscriminately thrown downslope. The Contractor will be required to implement the following measures:

- Construct temporary drains along exposed areas to channelize runoff and reduce the erosive forces of runoff waters.
- Construct retaining walls in landslide prone areas to retain the structures.
- Support suspended pipes with pipe support pillars.

7.2.14. Risk of Chance Find Procedures

As there probability of discovering chance finds is possible especially due to the nature of the project wherein excavation work along the pipeline alignment is required, there is the possibility that stakeholders including the Contractor, PIU, PMU are not aware of Chance Find Procedures, or their roles in ensuring adequate measures/procedures are followed to minimize damage, disturbance, and restoration of Chance Finds.

Mitigation measure: Follow Chance Find Procedure as detailed in Section 10.5.

7.2.15. Completion of Construction Works

Construction activities generate waste, which if not removed, can cause community nuisance, aesthetic issues, and become a source of potential contaminants for the environment.

Mitigation measures: Once the infrastructure work is completed, the PMU must follow the Biodiversity Action Plan and ensure the restoration of all cleared sites and closure of passageways to minimize human intrusion and activities in the forest.

The contractor must ensure the following:

- Dismantle site offices and worker camps, fill in pit latrines and restore all modified areas after completion of the work.
- Remove all waste from the worksite and worker camps and dispose of these as per prevailing practices in the Gewog.

7.3. Operation and Maintenance Phase

7.3.1. Conservation of Aquatic Ecosystem

As mentioned under pre-construction, the 30% minimum environmental flow requirement must be maintained for all times to come by the PMU. According to the cost benefit analysis conducted for the project, the project infrastructure has a lifespan of 70 years with investment in climate-proofing. The population projection is for 30 years, which means that after 30 years, if the population increases, then either alternative sources will have to be explored or the design altered to accommodate the increase in water demand.

7.3.2. Wear and Tear of the Infrastructure

During the operation phase, proper management of water infrastructure is critical to ensure functionality and sustainability and community well-being. Key considerations for operation and maintenance include:

- Train water user groups and unemployed youth or interested adults as well as project staff in O&M of the infrastructure. The budget for this must be provisioned under the activity on water user groups.
- Actively seek out and hire qualified women for water management positions while ensuring that there are equal opportunity and equitable selection processes in the overall recruitment related to the management and maintenance of water supply systems. If there are any specialized skills required, it is important to provide specialized training and capacity-building programs for women interested in water management careers, focusing on building the skills and knowledge necessary for success in the field.
- Since women assume the role of primary caregiver, it is also imperative to implement flexible work arrangements that allow employees to balance work and personal life, addressing caregiving responsibilities and other commitments.

7.3.3. Risk of Inadequate or Poor Drinking Water Quality

It is very important that the quality of the drinking water delivered complies with the National Drinking Water Quality Standards, to prevent any health hazard to end users.

Mitigation measures: During the O&M phase, the PMU must ensure regular supply as well as safe drinking water for the community. To do so, it must implement the following measures either through the PIU or water user groups:

- Prior to the completion of the infrastructure work and provision of water supply to the gewogs, develop and implement a Water Safety Plan (WSP) to ensure the safety of a drinking water supply, focusing on the key hazards identified from the catchment to the reservoirs. The plan must include the following activities:
    - test the water quality every quarter,
    - minimize contamination at the water source,
    - reduce or remove contamination through treatment processes, and
    - prevent contamination during storage and distribution.
- Engage communities in monitoring and maintaining the water supply system, with proper reporting channels for any issues related to water quality or contamination.
- Seek guidance from local authority and water quality experts to ensure that the water is safe for consumption while promoting safe water handling and storage practices among the users.

7.3.4. Disaster and Natural Hazards

The water scheme's design and material choices have partially mitigated risks from natural hazards and disasters, but there is always a risk of unexpected infrastructure damage.

Given its location and geological conditions, Bhutan is prone to earthquakes and storms caused by regional cyclones. Due to the risk of widespread damage, the project is at high risk for earthquakes. With forest clearance, blasting and excavation, especially on steep terrain, another ‘high risk’ for the project is landslides which can be triggered by incessant monsoon rains, especially if bioengineering and restoration works are not carried out.

Mitigation measures: The project must incorporate disaster risk reduction measures into the restoration of physical infrastructure and societal systems to “build back better” after a disaster.

Following any disaster, the Gewog must ensure the following:

- Immediately inspect all water infrastructure for damage.
- Carry out minor restoration of damaged infrastructure and bioengineering works in areas where landslides may impact water pipelines in the future.
- For large scale damage, request PMU for technical and financial assistance to restore the infrastructure.

7.3.5. Use of Available Water and Risk of Water Shortage

Once the water is available, this must be shared equitably and managed efficiently to minimize inefficiencies in supply and usage.

Mitigation measures: The PIU and Gewog must ensure the following:

- Monitor water usage in the future to determine water demand.
- Carry out water discharge measurements.
- Ensure compliance with Gewog By-laws on water usage and accountability.
- Promote the efficient use of water through water user groups.
- Promote household efficient water conservation practices.

7.3.6. Risk of Irrigation Induced Damage to Downslope Farms especially on Steep Slopes and Tampering

A concern expressed during the community consultation was that with abundant water for irrigation, there is a risk of irrigation induced soil erosion and damage to farmland below if the farms upslope is saturated with water and farmers do not manage the water carefully especially on steep slopes. This may also lead to loss of fertile soil and reduce farm productivity. There is a risk that the newly constructed water pipelines may be tampered with and damaged causing leakages that could trigger soil erosion or even landslides damaging farmland below.

Mitigation measures. Under Component 2 of the ACREWAS project, sustainable climate resilient farmland management practices in the project gewogs will include sustainable agriculture land management practices such as terracing of farmland on slopes; plantation of grass slip/hedgerow in dry-land agriculture for integrated fodder and soil stability measures and creation of water harvesting ponds/structures to store water. As these activities will mitigate this risk, the local authorities/gewog must ensure that upslope farmers participate in the training/demonstration of management practices and are made aware that they will be held responsible for neglectful irrigation practices and impacts/damage to downslope farmland.

As part of the water management initiative, the existing gewog by-laws must be reviewed and revised to ensure accountability for any tampering with the water infrastructure and irrigation water, in consultation with the community.

Farmers must also be held accountable for sustainable irrigation practices to ensure that irrigation induced soil erosion and damage to downslope farms do not occur.

8. ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

8.1. ESMP

The objective of the Environment and Social Management Plan (ESMP) is to provide management actions to mitigate negative risks and impacts, in accordance with relevant social and environmental policy frameworks, including Bhutan's legal policies, and institutional framework, UNDP's Social and Environmental Standards, and GEF safeguards. It has been prepared based on the environmental and social impacts assessed on the project.

The ESMP specifies the means through which the adverse environmental and social risks and impacts of the sub-project associated with construction and operational activities are avoided, reduced, mitigated, or compensated. The ESMP lists the specific risks and impacts and mitigation measures and recommends institutional arrangements for implementing and monitoring the mitigation measures. Specifically, it shows what plans and actions must be carried out; the key players that will be carrying out these plans and the specific timelines for when these will be carried out. Additionally, the ESMP indicates who will be responsible to monitor its implementation and when.

Several activities in the ESMP are to be carried out by the Gewog and Dzongkhag/PIU and PMU as well. The budget in Table 37 is an estimation and the amounts may vary, however, it is not expected to change significantly.

For the infrastructure work, the ESMP must be included in the contractor's tender documents and the cost of mitigation measures must be estimated and provisioned in their bid. Prior to the submission of the bid, the contractor is responsible for assessing site conditions so that all requirements to be incorporated into the ESMP can be planned and budgeted accordingly.

In general, the Contractor must allocate a budget for the following:

- contractor facilities and Worker Accommodation – including temporary housings, electricity, water supply, sanitation, and barricades in areas near settlements,
- fire extinguishers or adequate water pipes, tanks, buckets etc.,
- Worker health and safety – PPE, First Aid, emergency transportation, worker compensation,
- community health and safety – barricades, warning signage, use of sign board,
- air and dust pollution – provision for adequate water pipes, storage, dust suppression methods,
- waste management – cost of transporting waste from the sites/forest/worker camps to the nearest waste disposal facility/landfill site,
- contingency budget – for repair, replacement or compensation for any unanticipated impacts that may be required by the contractor.

Additionally, to minimize the impact on private land, the Contractor/Dzongkhag must ensure minimal or no economic displacement due to construction activities disrupt private landowner and further ensure that excavation of trenches ahead of pipe laying and backfilling must be efficiently scheduled during winter months while minimizing the period from the time of opening a trench to backfilling (unless there are exceptional circumstances agreed between the Contractors and PIU warranting a longer period). These measures must be included in the terms and

conditions of the Contractors' Contractual Agreements. Table 37 summarizes the project impacts and mitigation measures by project phase.

Table 37.Environmental and Social Management Plan

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
DESIGN and PRE-CONSTRUCTION						
Project design- selection of water source and water abstraction	Water source- Khuchi Khola	Source sustainability and seasonal water availability- Shortage in raw water supply due to higher variability in stream flows in the future.	-Ensure that source sustainability analysis has been undertaken to determine the appropriate withdrawal rate from the water source keeping in mind current water abstraction and future population and demand projections. -Ensure water discharge measurements are also taken during the lean season to understand the lowest flow. This can be undertaken as part of preparation of the local forest/watershed management activity, which is planned under activity 2.1.3 or under output 4.2 of the Project wherein a framework and Standard Operating Procedure (SoP) for regular reporting and sharing of data and reports on the state of river basin will be put in place to track and document water quality, quantity, availability, assets, and inventory. -Ensure that, as required by the Water Act 2011 and the Water Regulation of Bhutan 2014, 30% environmental flow is maintained in the streams for ecological purposes for all times by monitoring the same. -Ensure that the Gewog is included in the activities listed under other components of the ACREWAS project.	PMU	PSC	Not required
Source sustainability	Water source	Risk of water source contamination or drying up	Collaborate with the Department of Forest and Park Services to prepare Watershed Management Plan and implement conservation measures prior to construction. This includes conducting assessments and community consultations to understand the current socio-economic and land use, watershed conditions, identify and quantity threats to the water source and identify measures for watershed conservation in collaboration with the community and local government.	DOPFS	PMU	To be budgeted under project
Forest Clearance	Forest cover and biodiversity	Loss of forest cover and degradation	- Conduct 3 biodiversity surveys (pre-construction, mid/during construction and post construction). - Implement Biodiversity Action Plan.	DOFPS	PMU	To be budgeted under project
Clearances and approvals	Project gewogs	Risk of not seeking required clearances	Formal clearances/approvals -environmental clearance (obtained Annex3) -forestry clearance (partially obtained Annex 4) -community clearance and private land holder clearance -CFMG clearance (obtained Annex 5) -Process for Environmental clearance one month ahead (04.03.2024) if the construction is not completed by the contractor within the EC period	PMU	PSC	Not required

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
Project disclosure and information sharing	Community and Vulnerable communities	Risk of vulnerable groups not being informed about project activities	- Ensure active representation and participation of women and vulnerable groups at all stages of the project. - Follow and implement the Stakeholder Engagement Plan - -Disseminate information on the Grievance Redressal Mechanism developed for the Project on the MoIT website, official notification on the GRM committees and through Local Government (notification and social media chat groups).	PMU and PIU	PSC	To be budgeted under project
Contractor selection	Project gewogs	Risk that the contractor has no prior experience in water projects and/or is unaware of UNDP and RGOB applicable laws, rules and regulations or about environmental and social safeguard application during construction	- Ensure that the ESMP is included in the contract documents. - Ensure that bidding and contract documents include specific provisions requiring contractors to comply with all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities, on (b) equal pay for equal work of equal value regardless of Gender, ethnicity or caste, and on (c) elimination of forced labor; and the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites as well comply with applicable environmental and forestry laws and regulations. - Conduct a pre-bid meeting with the contractor to inform or brief them on relevant policies, standards and safeguard measures as outlined in the ESMP, that must be incorporated into the contractor's cost. - After awarding of contract, conduct contractor orientation on Environmental and Social Safeguard measures. During the orientation, ensure that topics such as relevant national laws and regulations, chance find procedure, GRM, Compliance with EC and FC, Environment and Social Management Plans, contractor self-monitoring and reporting, and water testing to ensure safe drinking water for workers are covered. - Form a Quality Control team and conduct training for contractors and PIU staff on Quality and Quality Assurance	PMU	PSC	50,000

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			to ensure use of standard materials, construction quality, safety and compliance.			
CONSTRUCTION PHASE						
Procurement of materials	Community	Risk of substandard materials	- Ensure that the Contractor is fully responsible for ensuring the supply of standard, quality materials as per the specifications specified in the bidding documents.	PMU	PSC	
Project activities	Environmental and social receptors	Compliance monitoring and effectiveness of mitigation measures	-Environmental and Social Safeguards compliance monitoring and review ESS reports. -Monitor the implementation of the ESMP and Management Plans onsite by the Contractor. -Continuously review the effectiveness of mitigation measures and make necessary adjustments based on community feedback and evolving needs.	PMU	PSC	To be budgeted under project-50,000
Recruitment of workers bb	Contractor's employees and workers	Risks to the occupational health & safety of employees and workers	- During the pre-bid consultation, the PMU should encourage the contractor to provide work opportunities to unemployed youth.	PMU	PSC	NA
			The Contractor must ensure the following: -Provide workers with good quality temporary accommodation, with ample and safe drinking water, electricity and sanitation facilities with separate toilets for females. Worker camps will be self-contained, regularly cleaned and properly organized to handle waste issues as per the waste management plan. -Ensure that adequate budget is allocated for provision of the required PPE for workers, for well stocked first aid at all work sites, and for emergency transportation in case of accidents at the worksite or camps. - Comply with the requirements of the national legislation on recruitment, management and health and safety of all workers and the Labour Management Plan. - Nominate an Environmental Health and Safety Focal Person (or equivalent) who will have the overall responsibility to ensure safe working conditions and environment for all workers.	Contractor	PIU	Must be included under Contractor estimate

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			- Provide the required PPE for workers and ensure that workers use these. - Provide guidance on the appropriate material haulage method, excavation and construction procedures and that workers should not be forced to work during risky weather conditions. - Conduct orientation/induction for new workers wherein workers are briefed on working procedures, health, safety, required social behavior, maintenance of worker camps, and restrictions on illegal activities in the forest. - Maintain a well-stocked first aid kit on site and maintain records of all accidents maintained including measures taken. - Provide immediate transportation to the nearest health facility for workers if required. - Provide adequate compensation to workers in case of temporary or permanent disablement or death due to work-related accidents. - Put in place a workplace Emergency Preparedness and Action Plan and brief workers on the plan. The Contractor must also ensure the following to address worker conflicts and grievances: - Ensure workers follow the Code of Conduct. - Resolve any conflicts between workers and impose sanctions for inappropriate conduct. - Establish a mechanism for workers to express their grievances.			
Construction activities	Public and local community	Impact due to influx of workers	● Ensure foreign workers are screened for communicable diseases such as HIV/AIDs, Malaria and Dengue prior to arrival at the site. ● Brief all workers on required social behavior and impose sanctions for inappropriate conduct. ● Provide training on GBVH to workers during the Induction Training. ● Ensure workers follow the Code of Conduct.	Contractor	PIU	Must be included under Contractor estimate

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			• Follow the GRM process and record grievances/complaints received from the public and actions taken. • The Contractor is to identify an area away from the community and water bodies to set up the Workers Camp. • The Worker Camp once set up is to have adequate sanitary facilities and soak pits. All discharge of water from kitchen, bathing and washing should be directed to the soak pit and the Contractor should ensure that no discharge is done in the drains and water bodies used by the community.			
Project activities	Women, youth and vulnerable groups	Lack of opportunities for women, youth and vulnerable groups	- Ensure that vulnerable persons including females are informed about the project activities and schedule in appropriate manner and language and ensure that persons with disabilities who are not able to attend community consultations, are informed directly. - Ensure active representation and participation of women and vulnerable groups at all stages of the project. - Provide training and awareness programs to community members on the importance of Gender equality and the value of women's and youth participation in decision-making processes, while ensuring the participation of vulnerable groups. - As far as possible, consider scheduling meetings including timing and locations that are accessible to women. - Provide capacity building for Dzongkhag Gender Focal Person and Kidu officers on how to engage with vulnerable communities. - Support and encourage women and youth to take on leadership roles within community organizations, including water management committees. - Provide capacity-building opportunities to enhance women and youth leadership skills.	PMU and PIU	PSC	Training budget can be allocated under GAP

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			- Seek the assistance of CSO/NGOS that actively promote the rights of people with disabilities and to assist with Gender issues and Gender equality. - Promote Gender-friendly Grievance Redress Mechanism			
Establishment of Contractor facilities (site office, employee accommodation, worker camps and storage areas)	Private land holders	Impacts from contractor facilities on private land	- Wherever possible, rent local houses/buildings instead of constructing employee accommodation to reduce project footprint. - Secure lease agreement or consent from private landholders if contractor facilities are located on private land.	Contractor	PIU	Must be included under contractor estimate
	Public and Community	Risk of providing inadequate accommodation and facilities for workers, unsanitary conditions, pollution and waste generation	- Comply with the requirements of the national legislation on recruitment, management and health and safety of all workers. - Implement the OHS Management Plan onsite. - Follow Labor regulations on accommodation sizes and provide workers with good quality temporary accommodation, with ample and safe drinking water, electricity, and sanitation facilities with separate toilets for females. Worker camps will be self-contained, regularly cleaned and properly organized to handle waste issues and located at least 15 m from streams to reduce polluting water bodies. - Provide adequate bins for waste storage, segregation and ensure that waste is disposed of as per Dzongkhag and Gewog requirements. - Minimize risk of faulty electrical installation in offices and worker camps. - Follow fire safety measures as mentioned above. - Ensure safe storage and handling of drinking water supply to avoid future contamination. - Maintain waste generation, storage and disposal records at site for both hazardous and non-hazardous waste in auditable format.	Contractor	PIU	Must be included under contractor estimate
Construction camps, material	Forest habitat and biodiversity	- The two water sources and sections	- Ensure compliance with the Environmental Clearance and the Forestry Clearance and share these conditions with the Contractor.	PMU	PSC	To be budgeted

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
transportation, tree felling and construction activities in SRFL		of the water pipeline are inside the BC -The pipeline alignment will traverse state reserve forest areas and 2 community forest areas Impacts on biodiversity and wildlife habitat Risk of non-compliance with the EC and Forestry clearance	- Ensure that adequate budget to pay the Royalty for the felling of trees to the Department of Forest and Park Services is incorporated into the project cost. - Implement the Biodiversity Action Plan			under project
	Forest habitat	Risk of damaging habitat, disturbing, or poaching wildlife, forest fire	The contractor must ensure that only those trees marked are cut and avoid or minimize cutting of trees to establish contractor facilities and avoid or minimize damaging trees during tree cutting and transportation as much as possible. - Brief all workers on forest and nature conservation rules and penalties governing illegal felling of trees, poaching, setting forest fires and indiscriminate waste disposal in forest areas. -Avoid using firewood for cooking in the worker camps through provision of gas or electricity for cooking. -Maintain fire extinguishers or adequate water pipes, tanks, buckets etc. at worker camps inside the forest as a precautionary measure - Ensure workers are briefed on fire hazards and trained to deal with such hazards. -The Contractor will be fully liable for any damage caused due to fire. - Adopt environment friendly construction techniques to ensure minimal damage to the surrounding. - Develop a spoil management plan (SMP) to ensure proper disposal of excess excavated materials, which include minimizing haulage and disposal of excess soils, and reuse	Contractor	PIU	Must be included under contractor estimate

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			excess soils for beneficial purposes such as raising the level of low-lying areas. This must be approved by PMU.			
Blasting work	Wildlife, communities and workers	Blasting will disturb wildlife and communities due to the noise and vibration. The dust, fumes and rockfall may also be a hazard to workers (and the community) and increase the potential for landslides in the surrounding area with unintended consequences on the stability of the terrain.	- Follow silent/controlled blasting techniques that minimize vibrations, dislodging fragmentation of rock fragmentation. - Comply with the Explosives Rules, 1989, in terms of permits, procurement, transportation, storage, security personnel, safety precautions, maintenance of records and blasting procedures. This includes ensuring that a competent person/blaster with a shotfirer's certificate and experience in preparing and carrying out blasting work is utilized. - Ensure the safety of all blasters through proper provisioning of the requisite PPE. - Ensure the safety of other workers during blasting operation through use of warning signs and audible signals before the commencement of blasting. -Report any loss or theft of explosives immediately to the permit issuing authority and to the nearest police station. - Immediately remove all remaining explosives from the site upon completion of blasting. - Prepare Emergency Preparedness and Response Plan and follow emergency procedures to evacuate injured persons immediately to a health facility in case of accidents. - Inform the community when the blasting work is going to commence so that all are aware about this and place an alarm prior to blasting work -Ensure that adequate safety and time (of blasting) signages are displayed in local languages in the site area	Contractor	PIU	Must be included under contractor estimate
Excavation along private farmland	Farmers dependent on crop production	Excavation of pipelines across cropland will disturb and impact farm practices and crop yield	-Ensure that prior information is given to all community members via the local government regarding commencement of the construction activities. -The contractor must schedule and ensure that excavation of trenches ahead of pipe laying and backfilling must be efficiently scheduled during winter months and minimize the period from the time of opening a trench to backfilling (unless there are exceptional circumstances agreed between the Contractors and PIU warranting a longer period). These	Contractor	PIU	Must be included under contractor estimate

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			measures must be included in the terms and conditions of the Contractors' Contractual Agreements. -Wherever possible, pipes should be laid as soon as possible, and trenches closed up promptly to reduce safety risks and dust generation. -Ensure that the consent of community members is sought by the contractor when selecting sites for locating constructor facilities (site office, storage sheds and worker camps) if these are located within the settlement area. -Restrict any excavation on sites of cultural significance unless written consent is provided by the socio-cultural group. -Avoid organizing meetings and training during festivals or occasions when the community is occupied with their traditional/cultural activities. -Adopt an inclusive approach and ensure that no community or groups with a distinct dialect, traditional beliefs and customs is left out or impacted negatively by the project. -Ensure that all trenches once excavated is cordoned off with hard and soft barricades -Ensure that pathways commonly used by the local community are not restricted with construction materials and equipment. -Ensure that adequate safety signages are displayed along the excavated trenches.			
Excavation work near settlements	Public and local community	Dust emission from excavation work	- Adopt dust suppression on windy days with water. - Maintain a water sprinkling logbook in auditable format.	Contractor	PIU	Must be included under contractor estimate
Excavation work near settlements	Public and local community	Risk of accidents	- Install signage of the details of construction work and signage displaying safety signs and barricades along risky areas to ensure community safety.	Contractor	PIU	Must be included under contractor estimate

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
Excavation near sites of religious and cultural significance	Socio-cultural groups	Excavation of pipelines across cropland will disturb and impact cultural and religious sites and practices	PMU must ensure the following: - Ensure that prior information is given to all community members via the local government regarding commencement of the construction activities. - Restrict any excavation on sites of cultural significance unless written consent is provided by the socio-cultural group. - Avoid organizing meetings and training during festivals or occasions when the community is occupied with their traditional activities. - Adopt an inclusive approach and ensure that no community or groups with a distinct dialect, traditional beliefs and customs is left out or impacted negatively by the project. - Use local dialect for ease of communication. - Disseminate Information on the GRM developed for the Project including contact details of the nominated Grievance Officer.	PIU	PMU	Must be included under contractor estimate
Excavation near sites of religious and cultural significance	Socio-cultural groups	Excavation of pipelines across cropland will disturb and impact cultural and religious sites and practices	The contractor must ensure that no work that will disrupt socio-cultural practices is carried out at these sites during religious ceremonies/prayers. - Where artifacts or archaeological resources are encountered during the excavation, the onsite chance find procedure as detailed in section 10.5 must be followed.	Contractor	PIU	Must be included under contractor estimate
Construction activities	Government or private property	Damage during construction or material transportation	- Repair any damage to government or private property at the contractor's own cost. - Disseminate information on GRM to the local community including the contact details of the GRM focal point. - Follow the Grievance Redress Mechanism	Contractor	PIU	Contractor liability
Completion of construction	Government or private property	Land degradation	- Dismantle site offices and worker camps, fill in pit latrines and restore all modified areas after completion of the work.	Contractor	PIU	Must be included under

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
works at each site			- Remove all waste from the worksite and worker camps and dispose of these as per prevailing practices in the Gewog.			contractor estimate
	Water pipelines	Risk of locating pipelines during O&M	- As-built drawing with GPS coordinates must be provided by the contractor to the PIU/PMU. This will be maintained by the PIU for O & M purposes.	Contractor	PIU	Must be included under contractor estimate
OPERATION AND MAINTENANCE PHASE						
Conservation of aquatic ecosystems and maintain ecological functionality	Aquatic ecosystems	Ensure aquatic ecosystems are sustainable and healthy for both humans and aquatic organisms	- Maintain 30% Eflow for all times to come	PMU	PSC	To be budgeted under project
Operation and Maintenance	Water users	Wear and tear of infrastructure	- Train water user group and unemployed youth or interested adults as well as project staff in O & M of the infrastructure. - Actively seek out and hire qualified women for water management positions while ensuring that there are equal opportunity and equitable selection processes in the overall recruitment related to the management and maintenance of water supply systems. If there are any specialized skills required, it is important to provide specialized training and capacity-building programs for women interested in water management careers, focusing on building the skills and knowledge necessary for success in the field. - Since women assume the role of primary caregiver, it is also imperative to implement flexible work arrangements that allow employees to balance work and personal life, addressing caregiving responsibilities and other commitments.	PMU	PSC	To be budgeted under project
	Water users	Inadequate and poor drinking water quality	- Prior to the completion of the infrastructure work and provision of water supply to the gewogs, develop and implement a Water Safety Plan (WSP) to ensure the safety of a drinking water supply, focusing on the key hazards	PMU	PSC	To be budgeted under project

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			identified from the catchment to the reservoirs. The plan must include the following activities: ● test the water quality every quarter, ● minimize contamination at the water source, ● reduce or remove contamination through treatment processes, and ● prevent contamination during storage and distribution. - Engage communities in monitoring and maintaining the water supply system, with proper reporting channels for any issues related to water quality or contamination. - Seek the guidance from local government and water quality experts to ensure that the water is safe for consumption while promoting safe water handling and storage practices among the users.			
Source sustainability	Water source	Risk of water source contamination or drying up	- Prepare watershed management plan and implement conservation measures -To minimize the risk of water contamination and related waterborne diseases, involve the community in monitoring and maintaining the system. - Set up clear ways for reporting water quality concerns and seek advice from local health centers such as PHCs (Public Health Centers) and hospitals to ensure a safe water supply for the communities - Encourage proper water handling and storage practices among the water users including both the community members and the project workers.	DOPFS	PMU	To be budgeted under project
Natural hazards and disasters	Water infrastructure and community	Risk of damage to water infrastructure	- Conduct regular inspection and maintenance of the water infrastructure (cleaning/replacing of broken or non-functional parts), including the intake structures, reservoirs, and distribution network, especially after a natural hazard/disaster. - Carry out minor restoration of damaged infrastructure and bioengineering works in areas where landslides may impact water pipelines in the future.	Dzongkhag and Gewog	PMU	To be budgeted under project

Activity	Key receptor	Risk/impact evaluation	Mitigation measures	Implementation	Supervision	Cost
			- For large scale damage, request PMU for technical and financial assistance to restore the infrastructure. - ensure that As built drawing is maintained and handed over to the supervising officer for O & M purposes			
Water usage	Water users	Shortage in water supply	- Monitor water usage in the future to determine water demand. - Carry out water discharge measurements. - Ensure compliance with Gewog by-laws on water usage and accountability. - Promote the efficient use of water through water user groups. - Promote household efficient water conservation practices	Gewog	PMU and PIU	To be budgeted under project
	Water infrastructure and Farmland	Risk of tampering with the water infrastructure	- As part of the water management initiative, the existing Gewog by-laws must be reviewed and revised to ensure proper water usage and accountability for any tampering with the water infrastructure and irrigation water, in consultation with the community.	PMU, PIU, and Gewog	PSC	NA
Restoration of degraded habitats	Forest cover and Biodiversity		- Restoration activities (minimum 2 trees planted for every tree cut)	DOFPS	PMU	To be budgeted under project

8.2. Implementation of the ESMP

The key responsibilities of the UNDP Country Office, PSC, PMU, PIU, and Gewogs for the implementation of the ESMP are detailed below.

UNDP Country Office

The UNDP Country Office is responsible for project oversight and for ensuring full compliance with M&E requirements including project monitoring, UNDP quality assurance requirements, quarterly risk management, and evaluation requirements.

Project-level monitoring and evaluation will be undertaken in compliance with UNDP requirements as outlined in the UNDP POPP (including guidance on GEF project revisions) and UNDP Evaluation Policy.

Additional mandatory GEF-specific M&E requirements will be undertaken in accordance with the GEF Monitoring Policy and the GEF Evaluation Policy and other relevant GEF policies. The M&E plan and budget included below will guide the GEF-specific M&E activities to be undertaken by this project.

Project Steering Committee

The PSC will provide the overall guidance to the PMU on project implementation and address any grievances that may be brought to the PSC. The PSC will also review the PMU's compliance to the ESMP as detailed in the ESMP table.

Project Management Unit

The PMU will be responsible for the procurement, construction and implementation and operation of the project. With respect to the ESMP, the PMU will be responsible for the following:

Prior to construction

- Ensure that institutional/management support, human and financial resources are allocated to environmental and social safeguard activities in terms of supervision, compliance monitoring and submission of required reports.
- Ensure that source sustainability analysis has been undertaken to determine the appropriate withdrawal rate from the water source keeping in mind current water abstraction and future population and demand projections.
- Ensure that as required by the Water Act 2011 and the Water Regulation of Bhutan 2014, 30% environmental flow is maintained in the streams for ecological purposes at all times.
- Ensure that the cost of environmental safeguard mitigation measures is included in bidding documents and contract.
- Ensure adequate budget to pay the Royalty for the plantation of twice the number of trees cut.
- Conduct a pre-bid meeting with the Contractor to inform or brief them on relevant policies, standards and safeguard measures as outlined in the ESMP, that must be incorporated into the Contractor's cost.
- After award of contract, conduct Contractor orientation on Environmental and Social Safeguard measures. During the orientation, topics such as relevant national laws and regulations, chance find procedures, GRM, Compliance with EC and FC, Contractor self-monitoring and reporting, and water testing to ensure safe drinking water for workers are covered.

- Form a Quality Control team and conduct training for Contractor and PIU staff on Quality and Quality Assurance to ensure use of standard materials, construction quality, safety and compliance.
- Ensure that the project gewogs are included in the activities listed under other project components for water source protection, watershed management conservation activities and awareness programs.
- Ensure project disclosure and information to all project stakeholders.
- Ensure that the GRM procedure is established with GRM committee members at all levels and information is disseminated to all stakeholders
- Discuss and finalize the Biodiversity Action Plan with the Department of Forest and Park Services.

During Construction

- Institute protocols and requirements to be followed by the PIU and Contractor in case of pandemics such as COVID 19, in line with the National pandemic protocols and instructions issued by the Ministry of Health.
- Review PIU monitoring reports to ensure that all the statutory and regulatory requirements have been met and are in compliance with UNDP Principles and Standard requirements.
- Report any unanticipated impacts and submit an ESMP monitoring report to the donor as required.

Project Implementation Unit

The PMU will also actively engage with other Responsible Stakeholders such as the Department of Forest and Park Services and Department of Water to implement conservation, climate-smart adaptation, PES, creation of water user groups and initiation of water management activities.

The PIU will be responsible for the construction supervision and monitoring of the project. With respect to the ESMP, the PIU will be responsible for the following:

- Follow standard supervision and monitoring of the construction work and ensure use of standard materials, construction quality, safety, and compliance.
- Provide guidance to the Contractor on ESMP implementation and UNDP Principles and Standards.
- Ensure that all the statutory and regulatory requirements have been met and that environmental clearance is renewed one month prior to its expiry.
- Review the monthly report submitted by the Contractor.
- Where water pipelines are damaged due to construction or activities by a third party, ensure that the responsible parties are liable to repair the damaged pipelines at their own expense.
- Ensure all requisite corrective actions are undertaken by the Contractor.
- Report on unanticipated environmental and social impacts (including those related to the health and safety of workers such as accidents) and the corrective actions taken to avoid any repetition of such incidents.
- Implement the GRM procedure and address and grievances brought about through the GRM in a timely manner. Record and report on this in the ESMP compliance monitoring report.
- Report any Chance Finds to the PMU immediately and implement the Chance Find Procedure.

- Institute protocols and requirements to be followed by the PIU and Contractor in case of pandemics such as COVID 19, in line with the National Pandemic Protocols and instructions issued by the Ministry of Health.
- Prepare and submit ESMP compliance monitoring report to the PMU.
- Constitute the Water User Group.

During Operation

- Develop and implement a Water Safety Plan (WSP).
- Carry out water quality and discharge measurements.
- Prevent contamination of the water sources through regular monitoring of the water source condition.
- Conduct regular testing of raw water quality to ensure it is still within the national drinking water quality standards and treat the water to reduce or remove contamination that could be present in order to meet the standards.
- Ensure regular maintenance (cleaning/replacing of broken or non-functional parts) of all components, including the intake structures, reservoirs, and distribution network.
- Conduct training for the Water User Groups from beneficiary chiwogs of the six gewogs in the project on O & M.
- Ensure that restoration works are carried out.

Gewog

The local government will be responsible for ensuring that construction activities do not negatively impact the environment or the community. With respect to the ESMP, the Local Government will be responsible for the following:

- Constitute the Grievance Redress Committee as per the GRM and resolve any grievance by following the GRM process.
- Ensure that prior information is available to all community members (not just representatives) especially women and vulnerable persons on the GRM process as well as the construction schedule in settlement areas.
- Assist the Contractor to seek suitable locations for worker camps and ensure that waste is disposed of at a designated location.
- Assist the PIU in ensuring compliance with the ESMP.
- Ensure that construction work does not hamper any religious and cultural sites or activities through providing prior information to the contractor.
- Engage actively with the PIU in project activities especially in review and revision of gewog by-laws to ensure equitable sharing of water, water usage and accountability for any tampering with the water infrastructure and irrigation water, creation of and training of water user groups and promotion of climate-smart agricultural practices and sustainable water management and water safety plan.

During operation

- Implement gewog by-laws and water safety plan.
- Ensure the equitable distribution of water to all community members and users.
- Monitor water usage in the future to determine water demand.
- Ensure community involvement in conducting water discharge measurements.
- Report any damage to the water infrastructure or issues with water shortage to the PIU.

Contractor

The Contractor will be responsible for all activities related to the construction of the project. With respect to the ESMP, the Contractor will be responsible for the following:

- Participate in pre-bid meetings and briefing/orientation on safeguard measures.
- Ensure an adequate budget is provisioned to ensure compliance with the ESMP.
- Abide by all relevant national laws and regulations and UNDP Principles and Standards requirements and obtain the necessary permits and clearances as required to implement the Project or construct worker camps, storage sheds and source the required electricity and water connections.
- Hire or designate a full-time Environment, Health and Safety Officer responsible for compliance with the ESMP.
- Comply with the Terms and Conditions of the Environmental and Forest clearances.
- Comply with the Quality Control and Quality Assurance requirements of the contract.
- Prepare a worker's code of practice for workers and immediately resolve any conflicts between workers, or between workers and the community.
- Prepare an emergency action plan and ensure workers are aware of this.
- Provide prior information to the community on the work schedule to minimize social issues during excavation.
- Undertake necessary corrective actions in case of damage or unanticipated impacts caused during the construction process.
- Ensure regular reporting to the PIU on work progress and alert management on any potential issues or delays.
- In case of pandemics such as COVID 19, follow the prevailing National Pandemic Protocols and instructions issued by the Ministry of Health and the Task Force, and immediately report to the PIU upon detection of positive cases among staff and workers.
- Develop Spoil Management Plan and get it approved by the PMU

Post Construction

The Contractor must:

- Dismantle site offices and worker camps, fill in pit latrines and restore all modified areas after completion of the work.
- Remove all waste from the worksite and worker camps and dispose of these as per prevailing practices in the Gewog.

9. ENVIRONMENT AND SOCIAL MONITORING

9.1. Background

The Project Management must monitor and measure the progress of implementation of the ESMP progress to ensure that environmental and social impacts as identified in the previous sections and any unanticipated ones are effectively mitigated. Specifically, the objectives of monitoring include the following:

- ensure compliance with the ESMP,
- ensure compliance with National laws, rules and regulations,
- ensure that corrective measures are undertaken where impacts occur,
- ensure that grievances of workers and community are resolved transparently on time and escalated up to the PSC if it cannot be resolved at the lower GRM committees.

Monitoring must be mostly conducted during the implementation phase. The pre-construction phase requires reporting on the status of project activities in terms of procurement, contract award and contractor meetings and orientation to the donor.

The PMU, with support from PIU, will monitor the progress of ESMP implementation and compliance and submit quarterly reports to the PMU. This will be based on site visits for physical verification and consultations with the Contractor and the Gewog. The contractor will be responsible for daily monitoring and will submit monthly reports on the ESMP along with the progress report.

Table 38.Environmental and Social Monitoring Plan.

Activity	Method of Measurement/Indicators	Frequency	Responsibility	
			Implementation	Supervision
Design and Pre-Construction Phase				
30% environmental flow maintained and source sustainability analysis	Project design	One time	PMU	PSC
Clearance and Approvals	Formal clearances/approvals: -Environmental Clearance -Forestry Clearance -Community Clearance and Private Landholder Clearance -CFMG Clearance	One time	PIU	PMU
Incorporation of EMP into bid documents	EMP included in bid document	One time	PMU	PSC
Incorporation of budget for ESMP and OHS in contract	Contractor bid document	One time	Contractor	PMU
Establishment of GRM	Formal office orders designating committee members	One time	PIU and PMU	PSC
Contractor briefing/awareness on ESMP requirements	- Minutes of pre-bid meeting with contractors - Contractor's attendance sheet	One time	PMU	PSC
Project disclosure and information	- ESMP copy at contractors' site office. - Project contact number on signboards	One time	Contractor	PIU
Construction Phase				
Construction Quality Control and Assurance	- Number of trainings conducted on Quality Control and Quality Assurance - Quality Control team by PMU - Quality Assurance officer/ team by Contractor	One time	PMU and Contractor	PMU
Consents and Permits	Tree marking by DOFPS.	One time	Contractor	PIU
Recruitment of workers	- Number of workers (nationals/foreign-by Gender) - Number of skilled and unskilled workers (foreign/national; male and female) - Number of workers below age 18	During recruitment	Contractor	PIU
Worker accommodation	- Number and location of worker camps - Availability of safe drinking water, electricity and sanitation facilities (with separate toilets for males and females) - Land lease agreement between Contractor and landowner for worker camp	Monthly	Contractor	PIU
Workers' welfare (health and safety)	- PPE distribution list/records - Ocular inspection of the cleanliness of worker camps - Safety structures/barricades installed - Overtime facilities provided - Emergency action plan and protocols in place - First aid kits at site	Monthly	Contractor	PIU

Activity	Method of Measurement/Indicators	Frequency	Responsibility	
			Implementation	Supervision
Design and Pre-Construction Phase				
	- Warning signs at risky/hazardous areas - Accident registers with incidents and actions taken - Number of fire extinguishers installed at site - Type and no. of trainings (training record) - Number of worker grievances and status			
Air pollution	- Use of electrical appliances - Ocular observation of vehicles and site conditions	Semi-annually	Contractor	PIU
Dust pollution/ minimization	- Ocular observation of dust and dust suppression measures undertaken as per ESMP - Number of complaints on dust by community/residents	Semi-annually	Contractor	PIU
Impact on stream quality	- Ocular observation of stream to check for waste, soil and effluent into streams	Monthly	PMU	PSC
Impact on downstream users	- Number of grievances from downstream users	One time	PMU	PSC
Water supply and conservation	- Number of water storage tanks - Measures taken during periods of shortage - Ocular observations of leaking pipes	Monthly or as necessary	Contractor	PIU
Waste management of worker camps, construction sites	- Number and types of waste bins installed - Number of truckloads of construction waste disposed of - Types of solid waste segregated and reused - Ocular inspection of camps and construction site - Segregation and storage of hazardous waste - Waste generation, storage and disposal records	Monthly or as required	Contractor	PIU
Noise pollution and disturbance to the local community	- Number of complaints received from neighboring community - Grievance log	Quarterly	Contractor	PIU
Generation of excavated soil	- Ocular observation of soil pileup at site	Monthly or as required	Contractor	PIU
Blasting	- Blasting permit - Blaster qualification - Warning signs and audible signals used - Community warning provided - Number of explosives used - Number of accidents due to blasting	Monthly	Contractor	PIU

Activity	Method of Measurement/Indicators	Frequency	Responsibility	
			Implementation	Supervision
Design and Pre-Construction Phase				
Site drainage	- Site drainage construction and maintenance - Ocular observation of site drainage	Monthly or as required	Contractor	PIU
Congestion and blockages/obstructions	- Number of complaints on congestion caused by Construction traffic or due to excavation work on access roads - Ocular observation of road conditions (spillage of construction material along access road, blockage of drains and footpaths)	Monthly	Contractor	PIU
Material storage	- Number of material storage sheds - Ocular observation on material storage at site	Monthly	Contractor	PIU
Community health and safety	- Consultation with community (minutes of meeting, participant list) - Number of safety signs - Installation of barricades - Obstruction of access routes/paths - Number of accidents - Number of complaints received	Monthly	Contractor	PIU
Biodiversity conservation	- Number of illegal activities reported/detected - Number of wildlife incidents (accidents/rescue, rehabilitation, and release) Number of trees damaged - Compliance with terms and conditions of the EC and FC	As required	Local Forest Office	PIU
Soil erosion and landslides	- Ocular observation of site conditions	Monthly	PIU	PMU
	- Construct temporary drains along exposed areas - Construct retaining walls in landslide prone areas	Monthly or as required	Contractor	PIU
Impact on private property	- Grievance Record - No. of grievances from private land holders - Ocular observation of excavation work on private land - Land lease agreement for contractor facilities on private land	Quarterly	PIU	PMU
Impact on Physical Cultural Resources	Grievance Record for number of grievances from community - Ocular observation of excavation work	Quarterly	PIU	PMU
Women and vulnerable groups	- Number of activities undertaken by Gender Focal Person of CSO/NGO	Quarterly	PIU	PMU
Project related grievances	- Grievance Record	Quarterly	PIU	PMU
Camp closure	- Ocular observation of site conditions after work completion	One time	Contractor	PIU
Operation Phase				

Activity	Method of Measurement/Indicators	Frequency	Responsibility	
			Implementation	Supervision
Design and Pre-Construction Phase				
Operation and maintenance	- Number of trainings on O & M - Maintenance records/Number of repairs carried out - Number of persons (including women) employed/engaged in O & M	Quarterly	Gewog	PIU
Water shortage	- Number of complaints by community on water shortage - Water usage report - Water discharge measurements	Quarterly	Gewog	PIU
Safe drinking water	- Number of water tests carried out and test results	Quarterly	Gewog	PIU
Natural hazard and disasters	- Inspection results out after natural hazards or disaster - Repair work or restoration of damaged infrastructure	Quarterly	Gewog	PIU
Water conservation activities	- Number of awareness/trainings on conservation measures - Creation of water user groups and number of members Number and type of conservation measures implemented - Revision of Gewog by-laws	Quarterly	Gewog	PIU
Accountability and Grievances	- Number of grievances and actions taken	Quarterly	Gewog	PIU
Restoration activities	- Number and types of restoration activities - Area of land restored	One Time	PIU	PMU

10. MANAGEMENT PLANS

10.1. Grievance Redress Mechanism

As required under the UNDP SES, to guarantee an Accountability Mechanism for the construction activities, the Stakeholder Response Mechanism (SRM) will be ensured through the establishment of a Grievance Redress Mechanism (GRM), which is based on the UNDP guidance on Grievance Redress Mechanism.

The Objective of the GRM is to provide a platform for individuals, peoples, and communities affected by projects to have access to appropriate grievance resolution procedures for hearing and addressing project-related complaints and disputes with the Contractor, PIU, PMU Responsible Parties or UNDP. The grievances that may arise can encompass social and cultural issues such as disruption of services or damages to private community or government property, agricultural land or environmental concerns and issues directly or indirectly caused by project activities.

The GRM process is designed to act as a problem-solving mechanism but not a substitute for the legal processes. It is an accessible, practicable, effective, transparent and time bound process to enable resolution of grievances on terms that are mutually acceptable to all parties involved and respecting the confidentiality of the aggrieved person/party.

The Aggrieved person/representative may submit the grievance in any mode convenient to the aggrieved party (in-person, over the phone, by letter, via email, on the website).

Eligibility for GRM
The grievance may be a perceived negative economic, social or environmental impact on an individual and/or group. The foreseeable concern about the potential to cause an impact must be related to the activity being implemented. Any individual may choose to be represented by another individual or group but must grant the representative a written authorization for representation.

The UNDP SES supplement guidance on eligibility uses four broad criteria to determine eligibility:

- Does the complaint indicate that the project has caused a negative economic, social, or environmental impact on the complainant, or has the potential to cause such an impact?
- Does the complaint specify what kind of impact has occurred or may occur, and how the project has caused or may cause that impact?
- Does the complaint indicate that those filing the complaint are the ones who have been impacted, or are at risk of being impacted; or that those filing the complaint are representing the impacted or potentially impacted stakeholders at their request?
- Does the complaint provide enough information for GRM staff to decide on the first three questions?

The Grievance Redress Mechanism
The GRM must be accessible to all persons/parties and therefore must be communicated or disclosed to the communities and residents of the project Gewogs and Dzongkhag through appropriate oral (consultations or outreach for vulnerable communities as well as through written

means in the form of pamphlets/office orders and posted on Project and Dzongkhag websites, and gewog and contractor signboards) in both Dzongkhag and English. This will be carried out prior to construction based on the assessment of the number of vulnerable people within the vicinity of the project components.
Vulnerable persons have been identified during the PPG in the project areas and their details entered in a simple database which will be useful to refer to when considering including vulnerable people in project awareness campaigns, trainings and other project activities.

Not all vulnerable persons will be able to participate actively in project activities (people with disabilities and the very old) but where they can, and with some arrangements by project staff, such as facilitation of transportation, or selection of accessible venues, their participation can be facilitated. Other vulnerable persons such as unemployed youth, women heading households and the poor can be represented as well in committees.

To ensure vulnerable people are represented, the project must -

- Refer to the database of vulnerable people and ask for nominations from the vulnerable persons or request for volunteers.
- Have criteria in place to be adopted by project staff to include a few members of vulnerable groups in the WUA Committees.
- Have representatives to participate on behalf of the vulnerable groups in the Committees and serve as a medium to articulate concerns of vulnerable groups as well as to coordinate with vulnerable group members on participation in project activities.

The GRM comprises four tiers, from the Contractor at the lowest level to the PSC at the highest level. For every level, the process to be followed will remain the same, in terms of lodging, acknowledgement, time for review and resolution and recording of the grievance.

The Grievance Redressal Committee will be constituted at levels 2-4 as shown in the table below.

Table 39.GRM Levels and Committee Members

LEVEL/position	**1**	**2**	**3**	**4**
	Gewog	**Dzongkhag**	**PMU**	**PSC**
Chair	Gup	Dzongda	Director/Director General (DoID)	PSC Chair
Vice-Chair	Mangmi	Dzongrab	Chief	PSC Members Secretary Project Dzongkhags MOF UNDP Director (Member Secretary)
GRM Focal Officer	Gewog Administrative Officer	Dzongkhag Planning Officer	Project Focal Person	
Members	• Relevant Tshogpa(s) • Relevant Sector Head • Dzongkhag Planning Officer	• Relevant Gup • Environment Officer • Gender Focal • Relevant Sector Head	• ESS officer • Component Manager. • Project Focal Officer; and • Finance/Accounts Officer. • Legal Officer • Dzongkhag Planning Officer	

Gender Inclusion

The presence of a woman as a women representative in the GRM committee must be ensured to promote easy access and confidentiality in instances of GBV cases.

The Terms of Reference of the GRM Committee

The Committees shall undertake the following roles:

- Ensure the resolution of grievances in a transparent, impartial, timely and objective manner.
- The Grievance Focal Person must receive and register the grievance in the grievance log and formally acknowledge receipt of the grievance within 3-5 working days. The acknowledgement must inform the aggrieved person/party that the grievance has been logged/registered, will be reviewed for eligibility and if found eligible will be discussed at the GRM Committee meeting.
- The Grievance Focal Person must follow the eligibility criteria to determine whether the grievance should be put up to the GRM committee or referred to other grievance resolution mechanisms such as a different office (anti-corruption, audit, legal or police) or require further clarification from the aggrieved person/party to determine eligibility. The Grievance Focal Person may consult the GRM chair for advice if uncertain on eligibility. Based on the determination, the focal must either respond to the aggrieved person/party that either the complaint is not eligible, or the complaint is eligible and will be submitted to the GRM committee for review.
- Once the grievance is determined to be eligible, the Focal, with the consent of the Chair, must convene the GRM committee meeting and maintain proper record of the minutes of the meeting (signed by all members).
- The GRM must prioritize and resolve the grievance objectively and at the earliest possible time or within 10 working days.
- The GRM committee may consult the GRM committee at the lower level, the aggrieved person/party, and the Contractor to adequately confirm whether the grievance is project related.
- The Grievance Focal Person must communicate the proposed outcome to the aggrieved person/party formally (in writing in English or Dzongkhag) as well as the outcome to the Contractor/Lower GRM committee/Gewog or responsible party for any corrective action to be undertaken.
- The Grievance Focal Person must disclose information on each grievance including date received, categorization of type of grievance (personal, environment, social), status of response and resolution, while upholding the confidentiality of the grievance by not disclosing personal details.
- If a grievance cannot be readily resolved, it must be immediately escalated to the next level.

Grievance resolution by the Contractor

- The Contractor must maintain a grievance log to record details of all grievances received (date, type of grievance, date of acknowledgement, action taken and date of response to the aggrieved person/party).
- The Contractor will review the grievance and resolve this within 10 working days.
- If the Contractor determines that the grievance is either not his/her responsibility or the grievance is not relevant to his/her activity, then the Contractor must inform the aggrieved person/party justifying the reason for not resolving the grievance in writing, and record this in the grievance log.

- If the aggrieved person/party is not satisfied with the action taken or with the Contractor's response, the grievance may be elevated to the next level.

Level 1. Grievance Resolution at the Gewog Level

The Gewog will constitute a Grievance Redressal Committee through an official notification.

- Any grievance shall be recorded in the grievance register by the Focal Officer at the Gewog with the information necessary for registration.
- If the GRM Focal determines that adequate solutions can be established within the next five working days, the Focal can decide on retaining the grievance at the first level by informing the aggrieved accordingly.
- The Focal must convene (with the consent of the Chair) the GRM committee meeting.
- The committee shall seek to resolve the grievance as soon as possible and avoid escalation within 10 working days.
- The Focal must maintain a grievance log to record details of all grievances received (date, type of grievance, date of acknowledgement, action taken and date of response to the aggrieved person/party).
- If the grievance cannot be readily resolved to the satisfaction of the aggrieved, then the grievance must be escalated to the next level.

Level 2. Grievance Resolution at the Dzongkhag Level

- The grievance shall be received by the Grievance focal officer (Dzongkhag Planning Officer) at the Dzongkhag.
- Any grievance shall be recorded in the grievance register by the focal officer with the information necessary for registration.
- If the GRM Focal determines that adequate solutions can be established within the next five working days, the Focal can decide on retaining the grievance at the first level by informing the aggrieved accordingly.
- The Focal must convene (with the consent of the Chair) the GRM committee meeting.
- The committee shall seek to resolve the grievance as soon as possible and avoid escalation within 10 working days.
- The Focal must maintain a grievance log to record details of all grievances received (date, type of grievance, date of acknowledgement, action taken and date of response to the aggrieved person/party)
- If the grievance cannot be readily resolved to the satisfaction of the aggrieved, then the grievance must be escalated to the next level.
- The committee may also choose to refer the grievance to the relevant agency/ministry, if deemed appropriate for resolution.

Level 3. Grievance Resolution at the PMU Level

- Any grievance that cannot be resolved at this tier shall be immediately referred to the PMU for resolution.
- The grievance shall be received by the Grievance focal officer at the PMU.
- Any grievance shall be recorded in the grievance register by the focal officer with the information necessary for registration.
- If the GRM Focal determines that adequate solutions can be established within the next five working days, the Focal can decide on retaining the grievance at the first level by informing the aggrieved accordingly.
- The Focal must convene (with the consent of the Chair) the GRM committee meeting.

- The committee shall seek to resolve the grievance as soon as possible and avoid escalation within 10 working days.
- The Focal must maintain a grievance log to record details of all grievances received (date, type of grievance, date of acknowledgement, action taken and date of response to the aggrieved person/party).
- If the grievance cannot be readily resolved to the satisfaction of the aggrieved, then the grievance must be escalated to the next level.
- The committee may also choose to refer the grievance to the relevant agency/ministry, if deemed appropriate for resolution.

Level 4. Grievance Resolution at the PSC Level

The grievance which cannot be resolved at the Dzongkhag level shall be immediately referred to the PSC wherein the same process as in Levels 2-3 will be repeated.

The Stakeholder Response Mechanism (SRM)

At the National Level, the Stakeholder Response Mechanism (SRM) at the UNDP Bhutan Country Office will be established prior to construction. This is responsible for receiving and resolving complaints about actual or potential environmental or social harm to affected persons arising due to project activities. To be eligible for an SRM response, the complaint must be related to the project, complainant must be able to explain the adverse socio-economic or environmental impacts from the project and indicate whether any steps were taken to resolve the grievance through the above project-level grievance mechanisms,

The SRM will minimize the risk of reprisal or retaliation by maintaining confidentiality of complainants' identity, if requested and especially so if the complaint is regarding sexual exploitation, abuse, and sexual harassment (SEAH) and respond to complainant concerns about reprisal or retaliation. In consultation with the complainant, the SRM will bring the complaint to the UNDP Accountability Mechanism at corporate level for review and action. The UNDP will be responsible for ensuring that the appropriate staff are identified and that these staff are briefed/oriented on the eligibility, procedures, and ensure that Project stakeholders are made aware of the UNDP Accountability Mechanism.

The UNDP CO website must clear and prominently display the link to a CO Web page describing UNDP's Accountability Mechanism along with contact information for submitting a complaint to the SRM at CO level, including email, cell phone number, messaging app channel, mailing address, and fax number. Aside from English, this information must also be provided in the national language

10.2. The Biodiversity Action Plan (BAP)

While the country supports a wide range of forest types and vegetation zones, these are broadly divided into three distinct eco-floristic zones: Alpine zone above 4000 m, the Temperate zone between 2000-4000 m, and the Sub-tropical zone between 150-2000 m[70].

71% of land (2,730,889 ha) in Bhutan is covered by forest[71] which are managed under different management regimes; protected areas, forest management units, local forest management areas, community forests and private forests[72]. Nationwide, the high forest cover provides natural habitats for many species. There are around 5,600 species of vascular seed plants, of which 94% are native, and 200 species are used for medicinal purposes. 282 species under 156 genera of Bryophytes and 350 species of fungi and 287 lichens have been recorded. About 129 species of mammals are known to occur in the country (26 globally threatened species, including 11 of the 36 globally recorded felid species), 736 species of birds (30 globally threatened species), 750 species of butterflies, 158 species of amphibians and reptiles and 120 species of fish have been recorded so far[73].

Tsirang Dzongkhag has 55,265 hectares of forest which translates to 87.5% forest cover in the Dzongkhag. This comprises broadleaf forest (77.64%), chirpine (6.51%), fir (0.40%) and mixed conifer (2.95%) and an additional 1,377 hectares (2.18%) is under shrub cover[74]. The project site falls within 1600-2060 m in elevation and is mostly dominated by warm broad-leaved forest. There are also two community forests in the project area. Within the project area, five mammal species were observed including the Golden Langur (endangered under the IUCN Red List and listed in Schedule II of the FNCA), Great Hornbill (Vulnerable under the IUCN Red List and listed in Schedule II of the FNCA), and the Rufous-throated Wren-babbler (Near Threatened under the IUCN Red List and listed in Schedule III of the FNCA). As the field visit was limited to five days, there are potentially more species that were not recorded during the rapid biodiversity survey.

The BAP presents the objectives, measures, and actions to enhance and conserve biodiversity and/or in accordance with the mitigation hierarchy to avoid, minimize, mitigate, potentially significant adverse environmental impacts to acceptable levels. The BAP must ensure that there is no reduction of any recognized Endangered, Vulnerable or Critically Endangered species and that any impacts are adequately mitigated.

Environmental Risks of the Project

Risk 1: Non-compliance with UNDP Principles and Standards and relevant National legislation
Risk 2: Reduction in forest cover, forest fragmentation and degradation of wildlife habitat due to forest clearance for various project components (construction of worker camps, intake structure, sand trap, reservoirs and laying of water pipelines in trenches)
Risk 3: Loss of wildlife from illegal poaching or accidents
Risk 4: Disturbance to wildlife and bird species due to workers and construction activities

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[70] National Biodiversity Centre, National Biodiversity Strategies and Action Plan of Bhutan 2014

[71] FRMD, 2016. National Forest Inventory Report Volume I, Department of Forest and Park Services, Ministry of Agriculture and Forests, Royal Government of Bhutan

[72] DOFPS, 2019. Forest Facts and Figures

[73] NBC website https://nbc.gov.bt/species-diversity/

[74] Land use Land cover data 2016

Risk 5: Impacts on aquatic ecosystems and loss of ecological functionality due to changes in flow regime and pollution
Risk 6: Lack of adequate human resources, capacities, and budget to implement the BAP

Objectives of the BAP

1. Comply with UNDP Principles and standards and all relevant National legislation
2. Minimize loss of forest cover and ensure continuity of forest landscapes
3. Protect and conserve Critically Endangered, Endangered, Vulnerable or Near Threatened species
4. Conserve aquatic ecosystems and maintain ecological functionality

Given the project design and the extensive forest cover in the project area, avoidance measures are limited, but measures to minimize and mitigate all perceived risks and threats have been outlined. Design measures to avoid environmental impacts have been discussed under project components (e.g., construction of gabion walls upstream of intake to block debris during monsoon season, construction of retaining walls to prevent landslides and fencing of water intake area).

The actions to achieve the Objectives are detailed in Table 40. The activities to be undertaken by the Contractor are embedded in the ESMP and therefore must be budgeted for accordingly by the Contractor.

Implementing and Monitoring Responsibilities
The responsible partners for implementation and monitoring of the BAP are the Department of Forest and Park Services (including the Ugyen Wangchuck Institute for Forestry Research and Training (UWIFORT), the Department of Water and the Department of Agriculture. However, if there are capacity or human resource constraints within the Departments, the PMU may also opt to seek the services of the College of Natural Resources (CNR).

Within the DoFPS, the Divisional Forest Office, Tsirang will take the lead role in implementing the activities projected in the action plan in close collaboration with the Nature Conservation Division (NCD).

Budget provisions
While some of the proposed activities are already budgeted under other project components, this will require synergy in the scheduling of activities. Other activities will require provision of budget from the project.

Table 40.Biodiversity Action Plan.

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
1	Comply with UNDP Principles and standards	Minimize all environmental and social impacts on Forest and water courses	Conduct pre-bid meeting to ensure that the contractor provisions for all mitigation measures as required.	PMU				PSC	Once in first quarter
			Provision budget to pay for the following: 1. Payment of royalty for forest clearance 2. Restoration activities (minimum 2 trees planted for every tree cut) 3. 3 biodiversity surveys (pre-during and post construction) 4. SMART patrolling by DOFPS 5. Preparation and implementation of Watershed Management Plan	PMU				PSC	Once in first quarter
			Conduct compliance monitoring and reporting every quarter	PIU				PMU	Every quarter
			Conduct Contractor orientation/train	PMU				PSC	Once in first quarter

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
			ing to inform the Contractor of the relevant laws and regulations and penalties for violation of the FNCA and FNCR						
2	Maintain forest cover and intact habitat	Minimize loss of forest cover and ensure continuity of forest landscape	Ensure strict compliance with the Forest Clearance	Contractor				DOFPS	Monthly
			Adopt environment friendly construction techniques to ensure minimal damage to the surrounding	Contractor				DOFPS	Monthly
			Build temporary facilities such as worker camps and storage facilities in areas where no trees will need to be cut	Contractor				DOFPS	Monthly
			Brief workers to minimize damaging trees during transportation/ material haulage as much as possible	Contractor				DOFPS	Monthly
			Mark only those trees that are absolutely required to be removed along the working corridor	DOFPS				DOFPS	Once in first quarter
			Conduct monitoring during tree felling to ensure that	DOFPS				DOFPS	Once in first quarter

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
			only trees marked are felled						
			Where possible, consider root balling of trees and transferring within or around the vicinity of the site	DOFPS				DOFPS	Once in first quarter
		Minimize habitat degradation during project implementation	Develop a spoil management plan (SMP) to ensure proper disposal of excess excavated materials, which include minimizing haulage and disposal of excess soils, and reuse excess soils for beneficial purposes such as raising the level of low-lying areas	Contractor				DOFPS	Monthly
			Construct retaining walls in landslide prone areas prior to soil disposal	Contractor				PIU	Monthly
			Incorporate the cost of transportation of waste from the construction site to a designated/approved waste disposal site and ensure that no waste is left in the forest	Contractor				PMU	Monthly

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
			Store all fuel/oil/lubricants in sealed containers, with an impermeable flooring to prevent spillage	Contractor				PIU	Monthly
			Conduct assessment of barren and degraded areas	DOFPS				PMU	Once in first quarter
			Plant trees in barren and degraded areas based on the assessment conducted during project preparation	DOFPS				PMU	Once after construction
		Minimize the risk of forest fire	Avoid using firewood for cooking in the worker camps. -Maintain fire extinguishers or adequate water pipes, tanks, buckets etc. at worker camps inside the forest as a precautionary measure	Contractor				DOFPS	Monthly
			Brief workers on fire hazards and conduct training to deal with such hazards	Contractor				DOFPS	Monthly
		To ensure appropriate restoration of forest habitat	After completion of the work at a particular site, dismantle site offices, storage sheds and worker camps and restore all	Contractor				DOFPS	Every time the worker camps are moved

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
			modified areas and remove all waste						
			Restore degraded areas through tree plantation	DOFPS				PMU	Once after construction
3	To ensure the protection and conservation of biodiversity especially Critically Endangered, Endangered, Vulnerable or Near Threatened species	To minimize disturbance to wildlife and birds	Conduct advocacy on Forest and Nature Conservation rules and penalties for local people and contractor	DOFPS					Once, first quarter
			Brief all workers on Forest and Nature Conservation rules and penalties governing illegal felling of trees, poaching, setting forest fires and indiscriminate waste disposal in forest areas	Contractor				PIU	Monthly
			Follow silent/controlled blasting techniques that minimize vibrations and disturbance to wildlife	Contractor				PIU	Monthly when blasting is carried out
			Limit construction work to daylight hours	Contractor				PIU	Monthly
			Instruct workers not to tamper with cavities in trees as these may be nesting sites of birds	Contractor				PIU	Monthly

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
			Restrict workers from wandering off into the forest- to minimize the risk of encounters and injury to people or wildlife (in case of self-defense)	Contractor				DOFPS	Monthly
			In case wildlife is found injured in the trench, immediately notify the nearest forest office so that rescue and rehabilitation can be carried out	Contractor				PIU	Monthly
		Generate information on species distribution and abundance	Carry out biodiversity assessment to establish a baseline of species biodiversity, distribution, and abundance, and map high-biodiversity value habitats, Carry out biodiversity assessment during and after construction	DOFPS				PMU	once, pre-construction,
			Develop the information database on biodiversity at the project site	DOFPS				PMU	Every quarter
		Enhance monitoring and surveillance	Monitor Contractor activities and conduct SMART	DOFPS				PMU	Every quarter

	Objective	Strategy	Activities	Implementation Responsibility	Pre-construction	Construction	Post construction	Monitoring Responsibility	Report on status
			patrolling in the project area, especially during periods when construction work is ongoing in the forest areas						
		Wildlife rescue and rehabilitation	Carry out immediate rescue, rehabilitation and release of injured wildlife and birds	DOFPS				PIU	Every quarter
	Maintain ecological functionality	Ensure water source is sustainable and healthy for both humans and aquatic organisms.	Maintain a distance of 15 m from water courses and have in place measures to prevent direct discharge of sewage into the streams	Contractor				PMU	Monthly
			Maintain 30% lean season environmental flow for all times	PIU				PMU	Every quarter
			Conduct water quality testing	PIU				PMU	Every quarter
			Prepare watershed management plan and implement conservation measures	DOFPS				PMU	Every quarter

10.3. Occupational, Health and Safety Plan

The Labour & Employment Act 2007; Regulation on Occupational Health, Safety, and Welfare 2022; and Regulation on OHS for the Construction Industry 2022 and UNDP Standard 7 will apply to the project and as such requires the Contractor to ensure proper labour and working conditions. The OHS plan is intended to aid contractors in planning for and implementing health and safety management measures during the pre-construction and construction phases.
It comprises of the key measures: health and safety policy, provision budget for OHS, health and safety officer, toolbox talks and training, hazard assessment and safety measures, provision of PPE, first aid and emergency plan, record keeping and reporting, sexual harassment and GRM for workers that will be established by the Contractor and communicated to the PMU and the CO. These measures are detailed below.

1. Health and Safety Policy

Any employer with 12 or more construction workers must prepare a written statement of health and safety policy in accordance with relevant provisions contained in Regulation on Occupational Health, Safety and Welfare 2022.

2. Budget provision

The contractor must provision a budget for PPE, first aid kits, emergency transportation in case of accidents, contingency budget to provide adequate compensation to workers in case of temporary or permanent disablement or death due to work-related accidents.

3. Health and Safety Officer

The management must establish and maintain a safe working environment, the contractor must nominate an Environmental Health and Safety Focal Person (or equivalent) who will have the overall responsibility to ensure safe working conditions and environment for all workers. The EHS officer be responsible for the following:

- Be stationed at the work site and ensure that a replacement is stationed at site, in case work requires the EHS officer to be absent from the site.
- Assist management in maintaining a safe working environment.
- Ensure workers follow the Code of Conduct.
- Plan and organize measures necessary for effective control of workplace accidents and personal injuries.
- Provide the required PPE for workers and ensure that workers use these.
- Carry out hazard-assessment and implement measures to ensure safe and healthy working conditions.
- Prepare an emergency action plan for disease, accidents, natural hazards and disasters.
- Organize and conduct toolbox talks and training on health and safety.
- Prohibit drinking alcohol or the consumption of any type of drug/intoxicant during working hours.
- Maintain and submit monthly records relating to accidents, diseases, and emergencies.
- Ensure that only certified persons carry out specialized work, like blasting and electrification etc., and that workers are not forced to work during risky weather conditions.
- No person under the age of 18 must be employed in construction work.

- Prepare and submit quarterly reports on OHS measures undertaken. In case of major emergencies immediately report these to the PIU.

4. Toolbox Talks, Awareness, and Training

It is important that workers are briefed and educated prior to commencement of work to ensure the health, safety, and security of all workers. These include but are not limited to the following:

- Induction or onboarding for new employees or workers on the policies, procedures, and safe work practices. This includes providing instruction and specific demonstrations on how to do the work safely. This includes appropriate material haulage method, excavation, and construction procedures.
- Toolbox talks to inform workers on site-specific hazards and safe work practices related to their work, safe operating instructions for equipment and use of fire extinguishers (if these are provided) and instructions regarding steps to be followed to fight fire outbreaks.
- Awareness and briefings on a) code of conduct and sexual harassment; b) work safety and use of PPE; c) risk of diseases, hygiene and maintenance of worker camps; and c) first aid and steps to be undertaken in case of an emergency due to natural hazards and disasters.
- Where a work-related injury is caused by an unsafe act or work practice, the EHS officer must conduct retraining for these workers.

5. Hazard Assessment and Safety Measures

Comprehensive hazard assessment is crucial to guarantee the safety of workers. Therefore, the Contractor must identify potential hazards and risks associated with the construction activity, including blasting works which require compliance with Explosives Rules, 1989.
Based on this assessment, the necessary safety measures must be put in place to minimize hazards identified, using technical and skilled persons such as blasters and safety protocols, installation of safety signages, provision of PPE, fire extinguishers and preparation of emergency response plans.
Additionally, safety inspections must be carried out to ensure that workers are using PPE, following the guidance given during toolbox talks, and ensure proper compliance in terms of transportation, storage, and safety precautions during blasting.
All temporary electrical installations at worker camps must be provided with earth-leakage circuit breakers.
All vehicles used at construction sites must comply with the requirements of the Road Safety regulations and all drivers must possess a valid driving license.

6. PPE, First Aid, Signage and Emergencies

Personal protective equipment (PPE) is essential for safeguarding workers' health and safety and minimizes exposure to work hazards. PPE such as helmets, goggles, masks, gloves, and boots must be provided to workers depending on the type of work they are required to carry out. The EHS officer must ensure that workers use the PPE and enforce this strictly.
The Contractor must ensure the safety of other workers during blasting operation through the use of warning signs and audible signals before the commencement of blasting. A well-stocked first aid kit must always be maintained at the site, especially for minor emergencies.

In case of serious injury/emergency, the Contractor must provide immediate transportation of the injured person to the nearest hospital. The Contractor must ensure that an emergency action plan is prepared by the EHS office in case of diseases such as COVID 19, natural hazards and disasters.

7. Record Keeping and Reporting

The EHS officer must maintain a record of a) PPE issued as evidence of PPE provided to workers; b) number of workers at the site; and c) number and type of incidents, diseases and accidents and measures taken, d) trainings provided to the workers and e) Grievance Logs. The EHS officer must prepare and submit quarterly reports on OHS measures undertaken. In case of major emergencies, the EHS must immediately report these to the PIU.

10.4. Contract Labour Management Plan

This Labour Management Plan (LMP) has been developed to manage labour risks during the construction period. It aims to ensure that all labour-related activities are conducted in accordance with the guidelines set forth by National legislation. The plan outlines the key measures and strategies that will be implemented to promote fair and safe labour practices, foster a healthy work environment, and enhance the overall well-being of the project's workforce.

The objectives of the labour management plan are as follows:

1. Ensure compliance with relevant labour laws and regulations of Bhutan and UNDP SES.
2. Promote fair employment practices, including non-discrimination, equal opportunities, and respect for workers' rights.
3. To protect project workers, including vulnerable workers such as women and persons with disabilities and prevent sexual harassment, abuse, and Gender-based violence.
4. Provide a mechanism for responding to, and resolving workers' concerns and grievances.

Compliance with Labour Laws and Regulations and UNDP SES

The contractor must ensure compliance with relevant labour laws and regulations of Bhutan and UNDP SES. This includes avoiding the recruitment of any person under the age of 18 years as a construction worker and ensuring that workers are not subject to coercion and forced labour in any manner whatsoever. Project workers must be provided with information and documentation that is clear and understandable regarding their terms and conditions of employment, including their rights related to hours of work, wages, overtime, compensation, and benefits.

Promote Fair Employment Practices, including Non-discrimination, Equal Opportunities, and Respect for Workers' Rights

The contractor must not discriminate against employees or workers in connection with recruitment, leave, wages, work hours or working conditions. Contractors must ensure fairness in recruitment or workers and must not discriminate against any person on grounds of gender, race, language, religion, class status, level of income, physical capacity, age, sexual orientation and sexual identity. All workers must be given equal pay for equal work or work of equal value and granted equal leave. Workers must be given equal opportunity and fair treatment in terms of leave, disciplinary action or compensation irrespective of Gender.

Sexual Harassment, Gender-based Violence, Worker Conflicts and Grievances

To prevent the incidence of sexual harassment or Gender-based violence (GBV) to female workers, the contractor must establish a clear zero-tolerance policy for GBV or sexual harassment. Workers must be made aware of the consequences/sanctions for engaging in such behavior or for inappropriate conduct and immediately resolve conflicts between workers.

Worker Grievances

The contractor must establish a mechanism/channel for reporting any GBV, sexual harassment or worker grievances. Workers must be informed about the mechanisms and channels to submit their grievances and their right to utilize these channels. Records of grievances and how they were resolved should be maintained.

Gender Based Violence

Contractors shall address the risk of Gender-based violence, through awareness- raising for the workforce about refraining from unacceptable conduct toward workers and local community members, specifically women, informing workers about National laws that make sexual harassment and Gender-based violence a punishable offence which is prosecuted, and reinforce the requirement for compliance with the code of conduct. Contractors must cooperate with law enforcement agencies if such cases lead to investigating complaints about Gender-based violence.

Code of Conduct (CoC)

The Contractor must maintain labour relations with local communities through a code of conduct (CoC). The CoC commits all persons engaged by the Contractor, including subcontractors and suppliers, to acceptable standards of behavior. The CoC must include sanctions for non-compliance, including non-compliance with specific policies related to Gender-based violence, sexual exploitation, and sexual harassment. The CoC must be written in English and Dzongkha (for local workers) and must be signed by each worker to indicate that they have received a copy of the CoC as part of their contract, have had the CoC explained to them as part of induction process, have acknowledged that adherence to this CoC is a mandatory condition of employment and have understood that violations of the CoC can result in serious consequences, up to and including dismissal or referral to legal authorities. A copy of the CoC must be displayed in a location easily accessible to all workers.

10.5. Chance Find Procedures

Scope

This procedure is applicable to all activities conducted by the contractor that have the potential to uncover heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during the construction activities. The procedure outlines the roles and responsibilities and the response times required from both the project staff, and any relevant heritage authority.

Induction/Training

All personnel, especially those working on earth movements and excavations, shall be inducted on the identification of potential heritage items/sites and the relevant actions required of them with regards to this procedure during the induction and regular toolbox talks.

Standard Operating Procedure

In case of discovery of the physical cultural resources by a person, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during the excavation or construction, the following steps shall be undertaken by the contractor and PMU:

- Upon detection of any artifact or archaeological resource, the contractor must immediately stop all activity in the vicinity of the find and immediately notify the supervisor onsite and the PIU.
- The PIU in turn will photo document the chance finds and inform the PMU. The PIU will instruct the Contractor to barricade the site and secure it with personnel (if removable antiquities or sensitive remains are found) to prevent any person from entering the site and causing damage or loss of articles from the site. The PMU will inform the Department of Department of Culture and Dzongkhag Development, Ministry of Home Affairs of the discovery immediately to avoid delay in the construction work.
- The Department of Culture and Dzongkhag Development (DoCDD) may provide their assessment from the photo documentation or conduct in-person site assessment to assess the chance find in detail.
- The PMU through the PIU will then instruct the Contractor on the way forward based on the assessment by the DoCDD.
- No construction is to be carried out by the Contractor until notified by the PIU.
- The PMU must ensure that any guidance or instruction given by the DoCDD is carried out correctly.
- The PMU must ensure that there are no delays in the verification process or in notifying the contractor of the procedures to be followed.
- For significant finds as determined by DoCDD, the PMU may require the distribution pipeline to be realigned to avoid further damage to the chance find.

Management of Replicable and Non-replicable Heritage

Replicable Heritage

Where tangible cultural heritage encountered is replicable and not critical, the following mitigation measures shall be applied:

Avoidance.

- Minimization of adverse impacts and implementation of restoration measures, in situ.

- Restoration of the functionality of the cultural heritage, in a different location.
- Permanent removal of historical and archaeological artefacts and structures.
- Compensation of loss where minimization of adverse impacts and restoration is not feasible.

Non-replicable Heritage

Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage. Nonreplicable cultural heritage must not be removed unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

Human Remains Management Options

The handling of human remains believed to be archaeological in nature requires communication according to the same procedure described above. The following measures are to be adopted:

Avoidance

The development project shall be redesigned to completely avoid the found remains based on the assessment undertaken by the concerned authorities.

Exhumation

- Exhumation of the remains shall be considered in a manner appropriate to the concerned authorities. This shall involve the predetermination of a site suitable for the reburial of the remains. Certain ceremonies or procedures may need to be followed before the construction activities can recommence in the area of the discovery.
- Emergency contact details of the concerned Department and contact persons shall be maintained by PMU and contractor in case of the chance find.

Record Keeping

It is pertinent that all finds must be registered. Photolog, copies of communication with decision making authorities, conclusions and recommendations/guidance, implementation reports are to be recorded and maintained by the PMU.

10.6. Stakeholder Engagement Plan (SEP)

The purpose of the SEP is to plan, coordinate and provide ample opportunities for all stakeholder groups to participate in the planning, decision making, preparation and implementation and monitoring of the ESIA activities for the Project.

The ESIA phase engagement activities focused on presenting the project details; discussing environmental and social impacts and seeking the views, concerns and recommendations; and managing expectations and clarifications on misconceptions regarding the project. The project design and schedule have been finalized and disseminated to the local community and their concerns have been incorporated into the ESIA and ESMP.

The SEP provides a plan to keep local communities, affected persons and project stakeholders informed about ongoing project activities and provides a platform for receiving and addressing stakeholder feedback regarding the project's social and environmental performance, in a meaningful, effective and timely manner.

The project's key stakeholders have been categorized into direct and indirect stakeholders in Chapter 5, Section 5.2.

Approach:

The SEP will be **Targeted** focusing on specific stakeholders and adapted to suit the objectives of the engagement, with special arrangements to facilitate access to information and decision-making by vulnerable groups: women, illiterate, unemployed, retired and marginalized persons.

The SEP will be:

Meaningful keeping in mind the social and cultural context, and disseminating information in a suitable language and medium, in order for these to be understood and tailored to the interests and concerns of targeted groups.

Free with no coercion allowing stakeholders to express themselves (or their representatives) openly while protecting them from the risk of reprisals.

Inclusive, Gender responsive and equitable across all sections of the targeted population by including marginalized/vulnerable groups (elderly, people with disabilities, landless poor and youth, as well as minority groups who may face social and economic exclusion).
Timely in terms of providing prior information to stakeholders regarding meetings and activities.

Ensure free and prior informed consent from communities is obtained during engagement and prior to any intervention as per the ACREWAS project SEP and documentation as per Annex D of the SEP to UNDP SES standard 6.

Have clear communication with two-way channels and tools that facilitate feedback from people, ensuring stakeholders know that their feedback has been considered and are aware of decisions taken based on consultations. Communication channels will be identified to ensure the stakeholder, be they members of the community, or staff in local-government or non-government agencies, are able to contact the focal persons in the Dzongkhag or national PMU. Focal persons at all levels of the project implementation structure, and within communities at all project sites will be accessible to communities.

Transparent with information pertaining to the project, including reports and training materials, shared in print and available on-line.

Documented through a record of discussions and agreements for transparency and accountability, and to ensure compliance with national requirements. This will also serve as a reference for future actions, decisions or for conflict resolution.

Dynamic in terms of continuity, coherence and execution and adapted to planned and ongoing activities according to the various project phases (pre-construction, construction and operation).

Previous Stakeholder Engagement

Previous Stakeholder engagements have been documented in the PPG and in Chapter 6 of this ESIA.

Future Stakeholder Engagement

Future stakeholder engagement will be carried out as summarized in Table 42. One of the risks of the project is that vulnerable and other marginalized groups may not be able to access information, benefits and access to decision-making platforms. Vulnerable groups must continue to be consulted during the implementation of the project and involved in project activities to ensure that they are not excluded from the benefits of the project as well as decision-making platforms. Vulnerable persons have been identified during the PPG in the project areas and their details entered in a simple database which will be useful to refer to when considering including vulnerable people in project awareness campaigns, training and other project activities.

Not all vulnerable persons will be able to participate actively in project activities (people with disabilities and those who are very old) but where they can, and with some arrangements made by project staff, such as facilitation of transportation, or selection of accessible venues, their participation can be facilitated. Other vulnerable persons such as unemployed youth, women heading households and the poor can be represented as well in committees.

To ensure vulnerable people are represented, the project must:

- Refer to the database of vulnerable people and ask for nominations from the vulnerable persons or request for volunteers.
- Have criteria in place to be adopted by project staff to include a few members of vulnerable groups in the WUA Committees.
- Have representatives to participate on behalf of the vulnerable groups in the Committees and serve as a medium to articulate concerns of vulnerable groups as well as to coordinate with vulnerable group members on participation in project activities.

The Stakeholder Engagement Plan is presented in the table below.

Table 41.Stakeholder Engagement Plan.

Stakeholder Group	Specific Interest (Project Activities)	Mode of Engagement (including participation, communication, reporting/monitoring, dissemination roles)	Period	Responsibility
All Project Stakeholders	Project activities involving the construction of the integrated water scheme	Disclose the ESIA and ESMP and GRM on MoIT website	Once, Pre-construction and if ESIA and ESMP are updated	PMU
		Provide prior information about meetings via official email	Throughout the project	PMU and PIU
	Grievance Redress Mechanism	Official notification on GRM establishment, committee members, and procedures	Once, Pre-construction	PMU and PIU and Local Government
Group 1: Primary Stakeholders				
Contractor	Environmental and Social Safeguards	Pre-bid meeting to ensure that the contractor provisions for all mitigation measures as required	Once, Pre-construction	PMU
Contractor	Environmental and Social Safeguards	Contractor orientation/training to inform the Contractor of the relevant laws and regulations and penalties for violation of the FNCA and FNCR	Once, Pre-construction	PMU
PMU and PIU	Environmental and Social Safeguards	Contractor orientation/training on ESS measures and reporting requirements	Once, Pre-construction	PMU
Project community	Project activities involving the construction of the integrated water scheme	Translate the project design, ESMP, the project timeline and GRM into Dzongkha and make this available by posting this at the Gup's office	Once, Pre-construction	PIU and Gup
		Provide prior information about meetings via social media chat groups	As needed, all phases	PMU
Projected affected persons	Project activities involving the construction of the integrated water scheme	Conduct a meeting only for project affected persons to inform them about the project design, ESMP, project timeline and GRM	Once, Pre-construction	PIU and Gup
Vulnerable groups	Project activities involving the construction of the integrated water scheme	Conduct a meeting only for vulnerable groups to inform them about the project design, ESMP, project timeline and GRM	Once, Pre-construction	PIU and Gup
		Distribute the project summary (Dzongkha) to vulnerable communities especially those not able to attend the meeting Inform about the project timeline, GRM and contact numbers of GRM focal persons via social media chat groups[75]	Once, Pre-construction	PIU and Gup
Project community	Recruitment opportunities	Inform about recruitment opportunities, types of work and place/location or contact to submit their application for employment	As needed, Pre-construction and construction	Contractor and Gup

[75] It is assumed that local government and their representatives have every household on their social media chat group.

Stakeholder Group	Specific Interest (Project Activities)	Mode of Engagement (including participation, communication, reporting/monitoring, dissemination roles)	Period	Responsibility
		through the Local Government and request them to share via social media chat groups		
Project community	Project disclosure	Post project signboard at work site with contact numbers of EHS officer and GRM focal in Dzongkha and English	Once, Pre-construction	Contractor
Project community	Cultural Heritage	Consult Gup or local community on festivals and religious occasions so that work can be avoided on these days	Construction	Contractor
Project community	Compliance Monitoring and reporting	Conduct meetings with project community, project affected persons vulnerable groups	Every quarter during construction	Safeguards Consultant/officer
Water user association	Review and revision of By-laws	Conduct meeting to review and revise water use by-law	Number of meetings depends on progress on review and revision	PIU and Gup
Contractor	Quality control and assurance	Conduct meetings to discuss progress reports	Monthly	PIU and Contractor
	Tree marking	Inform DoFPS on implementation and schedule tree marking	Preconstruction	Contractor
	Wildlife and bird species	In case wildlife is found injured, notify the nearest forest office so that rescue and rehabilitation can be carried out	As and when this occurs	Contractor
Group 2: Central and Local Government Agencies and Research Institutions				
Department of Water	Creation of Water User Groups	Conduct meetings with community to create water user groups	Number of meetings depends on progress with creation of group and meeting decisions	PMU, PIU and local government
		Inform vulnerable groups about creation of water user group through the Local Government and request them to share via social media chat groups Ensure members of vulnerable groups are included in water user groups		PMU, PIU and local government
	Source sustainability	Training of water user groups in monitoring and maintaining the water supply system, with proper reporting channels for any issues related to water quality or contamination	Prior to operation phase	PMU and PIU
	Operation and Maintenance of the water infrastructure	Training of water user groups in Operation and Maintenance,	Prior to operation phase	PMU and PIU
Department of Water and Department of Forest and Park Services	Watershed conservation measures	Conduct meetings to discuss activities to prepare watershed management plan and implement conservation measures	As needed	PMU and PIU

Stakeholder Group	Specific Interest (Project Activities)	Mode of Engagement (including participation, communication, reporting/monitoring, dissemination roles)	Period	Responsibility
Department of Forest and Park Services and the Ugyen Wangchuck Institute for Forestry Research and Training (UWIFORT)	Forest clearance	Seek forest clearance and pay Royalty	Pre-construction	PIU
	Implementation of BAP	Conduct meetings to discuss BAP, implementation mode and budget	Pre-construction	PMU
		Conduct meetings to present survey findings, compliance monitoring and discuss conservation activities such as restoration and tree planting and how to provide benefits to CFMG	After surveys, and as and when required	PMU
		Conduct advocacy on Forest and Nature Conservation rules and penalties governing illegal felling of trees, poaching, setting forest fires and indiscriminate waste disposal in forest areas	Pre-construction/construction	PMU
Community Forest Management Group (CFMG)	Community forest	Conduct meetings to discuss activities to include CFMG as project beneficiaries, such as provision of tree saplings and assistance in creation of nurseries	During construction and operation	PIU, DOFPS
GRM committees	Project Monitoring and GRM process	Conduct GRM committee meetings with aggrieved person and contractor	As and when grievances are reported to the GRM committee and as per GRM procedure	PMU, PIU and local government
Dzongkhag and Gewog Administration	Waste management	Seek approval to dispose construction waste - both hazardous and general waste	Pre-construction	Contractor
Health Facility	Testing of water quality	Seek assistance for water quality testing	Prior to sourcing water for drinking in worker camps	Contractor
			Prior to operation phase	PIU
Department of Agriculture	Climate-smart agricultural practices	Conduct meetings to discuss activities	As needed	PMU
Group 3: Organizations such as National Commission for Women and Children (NCWC) and Respect, Educate, Nurture, and Empower Women (RENEW) and the Tarayana Foundation.				
RENEW	GBV and sexual harassment	Seek support related to Gender-based violence and sexual harassment	During construction and operation	PMU
NCWC	GAP implementation and child protection and wellbeing	Seek support in implementing the GAP, mainstreaming Gender equality and child protection and wellbeing	During construction and operation	PMU
Tarayana	Marginalized communities	Seek support to reach out to marginalized communities, enhancing access to basic needs and services, training and enhancing livelihood opportunities	During construction and operation	PMU

10.7. Code of Conduct for Employees and Workers

The following code of conduct is applicable to all employees and workers.

The company must aim to promote professionalism, competence and ethical behavior and practices. It must promote zero-tolerance to abusive, unsafe, violent, or offensive behavior while providing a safe working environment for all employees.

All staff, employees and workers must comply with the Code of Conduct and abide by all National laws, rules and regulations and other applicable standards and requirements to ensure good health, safety, and wellbeing of all personnel as well as the public and local community.

Delivery of work

- Maintain a positive attitude and respect all colleagues and workers and the public
- Work competently and diligently
- Do no consume alcohol, drugs, or illegal substances during working hours
- Notify your supervisor if you are not able to come to work

Work Safety and Emergencies

- Maintain a safe working environment by ensuring that the workplace, machinery, tools and equipment and processes are safe without any risk to the wellbeing, health, and safety of all workers
- Report any unsafe working conditions and remove yourself from the situation
- Always maintain and use the required and appropriate personal protective equipment (PPE) while at work
- Follow appropriate measures as directed by the EHS Officer when dealing with electrical, chemical, or hazardous and explosive substances
- Report any accident at the worksite immediately to the EHS focal person
- Save the EHS focal person's number as the main point of contact during emergencies and follow emergency procedures
- Follow the Emergency Preparedness and Response Plan
- Open burning of wood is prohibited across all project areas. Ensure that no personnel disobey this mandate.
- All are required to attend all training and Toolbox Talks provided onsite by the Contractor.

Housekeeping

- Maintain cleanliness at the worksite as well as the worker camp and ensure that all waste is segregated as instructed and stored appropriately.

Environment

Poaching, hunting, fishing and cutting of trees without permit or indiscriminate waste disposal in the forest or streams is strictly prohibited. Any worker violating this will be liable as per the Forest and Nature Conservation Act 2023.

Community Health and Safety and Grievances

- No night-time construction activities including material/waste haulage near or within residential areas from 9 pm to 7 am

- Any grievances reported to you by a third party must be immediately reported to the site supervisor instead of dealing with it yourself
- Any grievances reported to you by a third party must be immediately reported to the site supervisor instead of dealing with it yourself
- Do not trespass into private homes or property
- Do not engage in prohibited conduct. This includes unwanted sexual advances, comments, jokes, derogatory language or unwanted physical contact and violence

10.8. Waste Management Plan

The waste management plan will ensure the reduction, reuse, recycling, safe transport and disposal of all types of waste generated during the construction period so that sound management practices are adopted for the safe storage, transportation and proper disposal of wastes. Waste management must be carried out in compliance with the Waste Prevention and Management Act of Bhutan 2009 and the Waste Prevention and Management Regulation 2012 (amended 2016). The Act and the Regulations prohibit the illegal dumping or release of waste into the environment. The contractor must brief all workers on good housekeeping practices, waste segregation, storage and restrict the disposal of waste into the forest or stream. The project activity will generate mostly construction, solid general waste, and liquid waste.

1. Construction waste

This includes pipe, concrete, sand, timber, electrical wires, packaging materials, water storage tanks and work camp construction materials such as used CGI sheets, glass and sanitary fixtures.
Waste Reduction -To minimize the quantities of waste generated, the contractor must ensure accurate material ordering, handling, and storage of construction materials. Where possible, cement bags or drums must be re-used for a different purpose such as waste storage.
Waste storage. All used cement bags not reused must be tied to prevent these being blown away on windy days. All excess, broken or used or non-usable construction material must be stored at a location near the construction site until removed.
Plastics, bottles, and cardboard once segregated must be delivered to the nearest recycling collector.
Transportation. When empty material transporting vehicles leave the site, the construction waste must be transported to the nearest landfill site at the Gewog and disposed there. Construction waste must be covered with tarpaulin during transportation to prevent spillage on the way to the disposal site.

2. General waste

The general waste must be segregated as biodegradable and non-biodegradable waste. Non-biodegradable waste can be further segregated into plastics, bottles and cardboard and paper.
For segregating and recycling materials on-site, used containers, bins or cement bags may be used. These must be distributed at specific locations at the site office and worker camps. All staff and workers must be instructed to reduce waste generation through recycling and shown how to segregate waste into plastics, biodegradable and non-biodegradable waste.
Biodegradable waste can be disposed of in a pit excavated near the site. This includes kitchen waste such as vegetables, food scrap (without meat, dairy or oily products) or paper. Layer the biodegradable waste with soil to prevent the waste from attracting rodents and reducing foul odor.
All other general waste (Plastics, bottles, and cardboard) once segregated must be delivered to the nearest recycling collector.

3. Liquid waste

Liquid waste includes used oil and lubricants. Although these may be in small quantities, spillage, or indiscriminate disposal of these can damage the environment.
Store used liquid waste in a separate leak proof container/bucket/bin. When these are full, ensure that the containers are sealed/leak proof and transport these out with the other general waste and dispose this in consultation with the District Environment Officer as there are no facilities for

disposal of liquid waste in the district. One option may be to drop off the used lubricants at the nearest workshop as these may be reused or by the workshops or because the workshops may be better equipped to dispose of the waste lubricants.

Wastewater from the construction camps must not be allowed to flow directly into the stream. Drains must be constructed to drain the sewage into a soak pit to facilitate the infiltration and percolation of water into the surrounding soil.

Post construction. After work completion, the contractor will be required to dismantle all temporary structures and remove construction waste from the site.

10.9. Emergency Preparedness Plan

Scope

The Emergency Preparedness Plan is aimed at ensuring the safety of all contractor staff and workers in case of an emergency such as accidents, natural hazards, and disasters. The plan also aims to minimize work disruption due to emergencies. The funds for reparations will be the responsibility of the Contractor.

The plan comprises of the following elements: hazard assessment, designating a responsible focal and an emergency team.

Hazard Identification/Assessment

Hazard identification and assessment of the transportation route, material handling, excavation and blasting work, pipe installation, construction of temporary structures and material storage.

The contractor must identify potential work hazards for both workers as well as the community and put in place measures to address or minimize these hazards.

Table 42. Measures for natural hazards and disasters

Activity	Type of hazard /risk	Rating High/Medium/Low	Probability of occurrence	Measures to minimize hazard/risk
Transportation				
Material handling				
Excavation				
Blasting				
Worker camps				

Responsible person and team

The Contractor must identify a staff responsible for coordinating response measures for any emergency. The Emergency Response Focal Person must be instructed with specific roles and responsibilities such as communication, first aid, transport/evacuation, and rescue.

The Focal Person may identify a team to be mobilized in case of an emergency.

Communication

To ensure clear communication during emergencies, a clear protocol must be established for all staff and workers to follow during an emergency. This includes providing a list of emergency contacts (local authorities, medical facilities and project and contractors staff).

These emergency contacts must be posted at the site office and shared with all staff and workers.

A social chat group for the emergency team must be created for immediate notification and response.

First aid and transportation

The Contractor must ensure that a first aid kit is always available at all sites for treatment of minor ailments. This must be well stocked and replenished as required. A vehicle must be kept on standby for transporting any seriously injured or ill person to the nearest health center or hospital as required.

Natural Hazards and Disasters

As Bhutan lies in the “most active” seismic Zone V, there is always the risk of a major earthquake. Also, landslides may occur due to blasting works and there are also fire hazards due to electric short-circuit or human negligence.

There are three categorizes of Disasters in Bhutan

Disaster Type I – the disaster can be managed with available resources and is within the coping capacity of the Gewog concerned

Disaster Type II – the disaster can be managed with available resources and is within the coping capacity of the Dzongkhag concerned.

Disaster Type III – the severity and magnitude are so great that it is beyond available resources and coping capacity of the Dzongkhag concerned[76].

In case of an impending disaster situation, the Dzongkhag and Gewog administration are responsible for establishing immediate contact with likely affected areas as soon as there is early warning information and provide orders for evacuation and immediate response [77]. The Contractor must ensure that the Gewog has the contact number of the Emergency Focal Person/Site supervisor so that information can be relayed from the Gewog to the site and vice versa.

The Contractor must

- brief all workers on restrictions on setting fires and raise awareness about the risk of wildfires due to indiscriminate disposal of cigarettes butts in the forest.
- brief on emergency response procedures to be followed for different types of hazards and disasters as indicated in the table below.
- ensure workers have the contact details of the Emergency Focal Person who must be contacted first in case of an emergency
- in case of any serious natural hazard or disaster such as landslides or earthquakes, the site supervisor must immediately check to see if all workers are safe
- immediately notify the gewog in case of any serious damage to workers or persons from the community
- follow the instructions and protocols of the Gewog and Dzongkhag in case of an emergency.

[76] Tsirang Dzongkhag 2019. Dzongkhag Disaster Management & Contingency Plan

[77] Tsirang Dzongkhag 2019. Dzongkhag Disaster Management & Contingency Plan

Table 43. Measures for natural hazards and disasters

Hazard/Disaster	Prevention	What to do	Type of equipment required
Fire	• Brief workers on emergency response procedures to be followed • Restrict campfires • Ensure electrical safety and prevent overload • Train workers in the use of fire extinguishers (if provided) and how to control electrical fires (e.g. never use water to extinguish an electrical fire. Instead use a blanket or fire extinguisher	-Cut off the power source to the electrical equipment or appliance causing the fire. If the fire is spreading rapidly, immediately alert all workers in the vicinity and evacuate all workers from the area. Assemble all persons and conduct a headcount of all workers Call the Fire station #110 for assistance and inform the Gup who will in turn mobilize emergency assistance	• Fire extinguisher (must be regularly checked) • Water pipes, storage tanks and buckets • Mobile for emergency communication • Transportation for evacuation of injure person
Windstorm	Keep abreast on extreme weather forecasts and avoid working in such conditions	In the case of accidents immediately evacuate injured persons to the nearest heath care centre/hospital	Mobile for emergency communication Transportation for evacuation of injure person
Landslide	Brief workers on emergency response procedures to be followed Follow blasting protocols by ensuring the safety of other workers during blasting operation through use of warning signs and audible signals before the commencement of blasting. Designate a 'spotter'- person responsible for observing and warning about potential hazards during work near landslide areas especially during rainy season Ensure workers wear required PPE.	Mobilize the emergency team from among the workers Assemble all persons and conduct a headcount of all workers In the case of accidents immediately evacuate injured persons to the nearest heath care centre/hospital Call the Royal Bhutan Police for assistance if persons are trapped under a landslide and inform the Gup who will in turn mobilize emergency assistance.	PPE First aid box Mobile for emergency communication Transportation for evacuation of injure person
Earthquake	Brief workers on emergency response procedures to be followed Conduct mock drill for workers - drop, cover, and hold and instruct them to stay away from trees, large boulders, windows or heavy objects.	Mobilize the emergency team from among the workers for search and rescue. Assemble all persons and conduct a headcount of all workers Call the Royal Bhutan Police for assistance if persons are missing	Mobile for emergency communication Transportation for evacuation of injure person

Hazard/Disaster	Prevention	What to do	Type of equipment required
	Designate an assembly point for all workers to congregate so that all workers can be accounted for.	for search and rescue operation and inform the Gup who will in turn mobilize emergency assistance.	

11. CONCLUSION AND RECOMMENDATIONS

The targeted assessment has been conducted as per the UNDP SES and the ESMF. This report has been prepared based on the design of the project that was presented to the local community during the consultation.

The project's positive impacts significantly outweigh any associated risks and adverse effects on the community, and these sentiments were consistently expressed in the FGDs undertaken. This initiative will also significantly alleviate the issue of domestic water scarcity and possibly rejuvenate cultivation of previously unused land through irrigation water supply.

The project has been designed in accordance with FPIC principles, as outlined in the UNDP SES policy which have been adopted to undertake comprehensive consultation with communities while surveying and selection of sites for different interventions and decisions on the design and operation of water infrastructure as well as during the targeted ESIA assessment. The community must continue to be informed of the project activities and schedule so that they are aware of any future project activities in advance.

Climate considerations have been incorporated into the project design, with retaining walls, HDPE/DI pipes and Reinforced Cement structures. These measures aim to mitigate risks of extreme events and natural hazards, with pipelines installed underground, or above ground in land-slide prone areas and stream crossings.

The impacts during the construction are predictable, temporary in nature and spread over six gewogs. With the pipeline traversing 143 private landholdings, the excavation and laying of the pipeline will cause temporary disruption to cropping practices and marginal loss of income from the sale of farm produce.

With two water sources inside the Biological Corridor and almost 2/3 of the water pipeline passing through state forest land and community forest, wildlife and bird habitat might be temporarily impacted and needs to be mitigated because of the presence of endangered and vulnerable species. Communities towards the source in Patshaling Gewog are expected to benefit through the PES program and an outlet has been incorporated into the design for future abstraction if required by Panthang Chiwog. The project must ensure that the members of the Bulkhay Community Forest benefit in kind through inclusion in other project activities under the overall project.

As the impacts due to project design and operation will cause permanent changes in flow regime, the project must ensure to maintain the 30% lean season environmental flow in the water course for all times to come.

While the project aims to fulfill the constitutional rights to basic services - access to clean water, hygiene and assured irrigation for food security and economic well-being, it must continue to follow the human rights-based approach to reducing inequalities and improving the livelihoods of poor and vulnerable people.

Quality control and quality assurance during construction and capacity building of water user groups for operation and maintenance and testing of water quality to ensure safe drinking water are critical in ensuring sustainability and infrastructure resilience.

To improve monitoring of infrastructure failures for both volume and quality of water supplies, other activities under the project will support integration of new/improved technologies so that vulnerability of the infrastructure to climate-induced hazards or disturbances are detected and solutions provided in a timely manner. Collaboration with the private sector will be explored to promote IT-based solutions for water management including automated IoT/ICT based systems.

The project will generate employment and business opportunities for local suppliers of construction materials as well as material transporters. The socio-economic benefits of obtaining temporary employment can be significant for low-income people within and outside the district.

There are provisions under other project activities to integrate new technologies to detect climate hazards and explore collaboration with the private sector for IT-based water management solutions. The project must ensure that by the completion of the infrastructure, adequate governance and capacities are in place for enhanced infrastructure monitoring for water quality and volume, climate-smart management and improved and equitable water service delivery. Disaster risk reduction measures must include restoration of physical infrastructure and societal systems to build back better.

Specific to the implementation of environmental and social safeguard measures to mitigate any foreseen or unanticipated impacts, the roles and responsibilities of the PMU, PIU, Gewogs and the contractor have been outlined. The project must promote Gender-friendly Grievance Redress Mechanism and continuously review the effectiveness of mitigation measures and make necessary adjustments based on community feedback and evolving needs. Farmers must also be made accountable for sustainable irrigation practices to ensure that irrigation induced soil erosion and damage to downslope farms do not occur.

The overall conclusion of this process is that there should be no significant adverse environmental impacts because of location, design, construction, or operation of the project provided all the mitigation measures in the ESMP as well as other activities such as creation of water user groups, conservation activities, climate-smart practices and capacity building are also provided as planned.

If the design is revised or modified the PMU must ensure that the ESMP is updated based on the final detailed design and submitted to UNDP for review.

12. ANNEXES

Annex 1. Participant list- Dzongkhag Consultation

Participant list, Dzongkhag Consultation, 11 October 2023, 9.30AM, Tsirang Dzongkhag

page 1 of 4

ACREWAS CONSULTATIVE MEETING 11/10/2023

Sl.No	Name	Designation	Agency	email id	signature
1	Krishna lal Dhakal	Tshogpa	Dgaray Khor	krishna lal dhakal 20220 @gmail	[signature]
2	Ratna lal Monger	-"-	Tsholingkhor	ratna lal 7887 @gmail.com	[signature]
3	Bijay Kumar Monger	Mangmi	Tsholingkhor	bijmonger 10@gmail.com	[signature]
4	Bikash Rai	Tshogpa	(Pangthang) Patshaling	bikashrailung93@gmail.com	[signature]
5	Pema Dorji Tamang	Tshogpa	(Thakhorling) patshaling	PemaTamang1974@gmail.com	[signature]
6	Nelen Dorji	ADAO	Health	nelendra@tsirang.gov.bt	[signature]
7	Sonam	AE	Engineering	sonamsonam@tsirang.gov.bt.	[signature]
8	Kencho Tshering	AE	"	Kencho@tsirang.gov.bt	[signature]
9	Chimi Dorji	Sr. FO	DFO, Tsirang	chimidorji@moenr.gov.bt	[signature]
10	Kinzang Chophel	Offtg DAO	Dzongkhag	kchophel@tsirang.gov.bt	[signature]
11	Wangchu	Tshogpa	Mendrelgang	-	[signature]
12	Chundu Tshering	Tshogpa	"	Chundutshering@17@gmail.com	[signature]
13	Tshering Choden	Tshogpa	Mendrelgang	Tchhoden21@gmail.com	[signature]

ACREWAS CONSULTATIVE MEETING 11/10/2023

Sl.No	Name	Designation	Agency	email id	signature
1	Sam Man Tamang	Mangmi	Rangthang ling	Samman1829@gmail.com	
2	Dil Bdr Tamang	Tshogpa	-do-	Dilbdrtamang@gmail.com	
3	Ratna Bdr Tamang	-do-	Rangthang ling Chazingma	Rat@gmail.com	
4	Purna Bdr Monger	-do-	Rangthang ling Nymelod	PurnaMonger6@gmail.com	
5	Kinzang Wangdi Tamang	Tshogpa	Nayme dzong Ring	Wangdik736@gmail.com	
6	Tashi Choden	GAO	Kilkhorthang	ychoden@trirang.gov.bt	
7	Bhola nath Chapagain	Tshokpa	Kilkorthang	Bhola2026@gmail.com	
8	Sonam Kelzang Dechen	GAO	Patshaling	skdechen@trirang.gov.bt	
9	Baliman Tamang	Tshogpa	Barshong	Balimantamang5@gmail.com	
10	Man Bhoj Tamang	-do-	-do-	mandhojtamang1990@gmail.com	
11	Rinzin Dorji Tamang	Mangmi	-do-	Rinzindorji1968@gmail.com	
12	Tshering	Mangmi	Mendrelgang	Hshering@gmail.com	
13	Chabi Kumar Rai	Gup, Patshaling	Patshaling Gewog, Trirang	Crai@trirang.gov.bt	

ACREWAS CONSULTATIVE MEETING 11/10/2023					
Sl.No	Name	Designation	Agency	email id	signature
1	Ugyen Wangmo	Tshogpa	Mendral gang	Ugyen Wangmo Bhutan 123	[signature]
2	Pancha Dorji Tamang	Tshogpa	Mendralgang	[illegible] @gmail.com	[signature]
3	Sonam Jamtsho	Offtg. DLR	Land Record	sjamtsho04@[illegible] gmail.com	[signature]
4	~~[illegible] Deki~~	~~Freelance Contract (Represent)~~	~~S.L Private Limited Thimphu~~	~~[illegible] gmail.com~~	[signature]
5	Dawa Dem	AFO	DAT	ddem@tsirang.gov.bt	[signature]
6	Sonam Choeno	Mangmi Kilkhorthang	Kilkhorthang	sonamchoeno[illegible]@gmail.com	[signature]
7	Phub Dorji	Gup	Sergithang	Pdorji@gmail.com	[signature]
8	Sanjelal Poudel	Gup	Barshong	slpoudel@tsirang.gov.bt	[signature]
9	Passang Singh Tamang	Gup	Tsholingkhar	pstamang@tsirang.gov.bt	[signature]
10	Phuntsho Tobgay	CFO	DFO, Tsirang	phuntsho@moenr.gov.bt	[signature]
11	Lakshmi Kumari	Tshogpa	Sergithang		[signature]
12	Kaluen Zangpo	GAO	Sergithang	kzangpo@tsirang.gov.bt	[signature]
13	Sonam Dorji	Mangmi	Sergithang	Sonamgot@gmail.com	[signature]

ACREWAS CONSULTATIVE MEETING 11/10/2023					
Sl.No	Name	Designation	Agency	email id	signature
1	Yeshey	Gup	Mendrelgang	[illegible]@tsirang.gov.bt	
2	Lal Raj Suna	Gup	Rangthangling	lsuna@tsirang.gov.bt	
3	Pema Lhamo	GAO	Barshong	plhamo@tsirang.gov.bt	
4	[illegible]	[illegible]	[illegible]	dorjiwangdi@tsirang.gov.bt	
5	[illegible]				
6	Pema Dargay	RAO	Mendrelgang		
7	Karma Wangmo	Sr. PO	DAT	karmawangmo@tsirang.gov.bt	
8	Deki P. Yonten	Env. & Social Consultant.	PCS	-	
9	Tandin	PCS	PCS	-	
10	Yangchen D. D.	"	"	-	
11	Jigme Sonam	"	"	-	
12					
13					

Annex 2. Participant lists- Community Consultation

Date: 12 October 2023, 9.30AM, Mendrelgang Gewog
page 1 of 5: Participants from Tsholingkhar Gewog

Place: ~~Mendrelgang~~ Tsholingkhar Gewog

Date: 12/10/2023

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1	Ganga Pati Mishra	M	59	Dhubchugang	T/khar	Dhubchu	17645252	[signature]
2.	Karma Dorji	"	63	"	"	"	17645159	[signature]
3	Nar bdr Alley	"	41	"	"	"	17710729	[signature]
4.	Krishna Lal Dahal	"	51	"	"	"	17871899	[signature]
5.	Sangay Thinley	"	55	"	"	"	17697460	[signature]
6.	Ratna Bdr Rungu	"	49	Tsholingkhar Toed	"	T/Toed	17553479	[signature]
7.	Bhakta Bdr Mongar	"	49	"	"	"	~~7762276~~	77811627
8.	Jit Bdr Mongar	"	50	"	"	"	17740219	[signature]
9.	Ram Bdr Mongar	"	46	"	"	"	17246440	[signature]
10.	Om Bdr Mongar	"	51	"	"	"	17520150	
11.	Jit Bdr Mongar	"	52	"	"	"	17300832	
12.	L.B. Tamang	"	55	Dhubchugang	"	Dhubchu	17710844	[signature]
13.	K.B Tamang	"	61	"	"	"	17602016	[signature]
14.	Passang Thinley	"	43	Gup, Tsholingkhar	"	"	17982979	[signature]
15.	Shravan Gyelthen	"	41	Gedo, "	"	"	17719467	[signature]
16.	Bijay Kumar	"	35	Mangmi, "	"	T/Toed	16915995	[signature]
17.	Passang Thinley							

Submitted by
Passang Thinley
Gup

[signature]

Place: _____ Date: _____

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1.	Leela Raj Sunwar	M	35	Rangtholing	Rangthaling	Dorchengag	17697478	
2.	Sanman	m	46	-do-	-do-	-do-	17697421	
3.	Kinzang	m	33	-do-	-do-	-do-	17667837	
4.	Sangey [illegible]	m	38	-do-	-do-	-do-	17992969	
5.	Dil Bdr Tamang	m	49	-do-	-do-	-do-	17635928	
6.	Rabin Bdr	m	48	Chorringma	-do-	Chorringma	17740395	
7.	Kenzang	m	28	Rangthaling	-do	Neymeda	17383781	
8	Purna Bdr	m	47	do-	-do-	Nimazer	17327727	
8.	Nigma Gyltshen	m	37	-do-	-do-	Neymeda	17559010	
9	Khadka Bdr Sunwar	M	48	Neymeda "	"	"	17425854	
10	~~Ugyen Gyeltshen Sherpa~~	~~m~~						
11	Dawa Karma Sherpa	m	45	"	"	"	17710646	
12	Nim Chuki Sherpa	F	36	"	"	"	17757458	
13	Dawa Bdr Tsering	m	44	"	"	"	17611651	
14	Yeshey Dorji Sherpa	m	43	"	"	"	17673990	
15	Krishna Maya	F	36	"	"	Dhorchengag	17879507	
16	Mon Maya Tamang	F	29	"	"	"	17722640	
17	Purna Tamang	m	65	"	"	"	17592712	
18.	Money Goley	m	54	"	"	"	17706298	

page 3 of 5: Participants from Rangthangling Gewog

Place: ____________________ Date: ____________________

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
19	Sonam Tamang	M	52	Rangthangling	Rangthangling	Duechergang	17761459	
20	Gember Tamang	M	66	"	"	"	17541104	20
21	Ran Bdr "	M	78	"	"	"	17556764	21
22	Indra Bdr Tamang	M	50	"	"	"	17261429	
23	Passang Norbu	M	33	"	"	"	17822882	
24	Tshering Gem	F	45	"	"	"	17608267	24
25	Jangchu Sengye	M	42	+ BPC	"	"	17702003	

Place: Mendeelgang Gewog Center

Date: ____________

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1	Yeshi Choden	F	23	Kilkhorthang Gewog (GAO)	Kilkhorthang		ychoden@tsirang.gov.bt	
2.	Sonam Lhamo	F	35	" (Mangmi)	"		sonamlhamo447@gmail.com	
3	Bola Nath Chapagai	M	57	" (Tshogpa)	"	Menchuna	apchura2019@gmail.com	
4	Chura Mani Sharma	M	53	Beneficiaries	"	"	17721019	
5.	Aga Nidi Acharya	M	27	"	"	"	~~17705712~~ ~~17655967~~	
6.	Lok Bahadur Rongthe	M	61	"	"	"	17655967	
7.	Dorji Lhamo	F	67	"	"	"	17922168	
8	Hari Maya	F	34	"	"	"	77359387	
9	Nima Zam	F	58	"	"	"	17891760	
10	Ugyen Chenzom	F	66	"	"	"	77616905	
11.	Prakash Monger	M	46	"	"	"	17921978	
12.	Som Bahadur Khamgai	M	68	"	"	"		
13.	Anup ~~Moth~~ Mahat	M	65	"	"	"	17651119	
							17460042	

Place: Mendrelgang Gewog Center Date: _____

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1.	Deki P. Yonten	F	–	Env. & Social consultant, PCS	–	Thinphu	–	
2.	Tandin	M	–	PCS	–	〃	–	
3.	Yangchen D.D.	F	–	PCS	–	〃	–	
4.	Tsigye Sonam	M	–	PCS	–	〃	–	
5.	Kencho Tshering	M	–	DEHSS, Tsmg	–	–	–	
6.	Pema Dorjee	M	–	M/gang	–	–	pdorjee@dsirang.gov.bt	
7.	Kinley	M	–	DEHSS, DAT	–	–	–	

Community Consultation
Date: 12 October 2023, 2 PM, Mendrelgang Gewog
page 1 of 3: Participants from Patshaling Gewog

Place: Patshaling Date: 12/10/2023

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1.	Chenga Lhamo	F	56	Pangthang	Patshaling	Pangthang	17877029	
2.	Chandra Prasad Gurung	M	54	"	"	"	17442458	
3.	Bhirka Bdr. Rai	M	55	"	"	"	17710029	
4.	Binod Rai	M	28	"	"	"	17806946	
5.	Dil Bdr. Rai	M	35	"	"	"	17871988	
6.	Khal Singh Rai	M	52	"	"	"	17834131	
7	Bikash Rai	M	30	Patshaling Gewog Adm, Tshogpa	"	"	17871472	
8.	Rocha Bir Tamang	M	46	Thathorling	"	Thathorling	17401036	
9	Tika Rai	M	30	"	"	"	17460546	
10.	Sil Maya Tamang	F	43	"	"	"	17590332	
11.	Bal Maya Tamang	F	47	"	"	"	17322632	
12.	Sonam Kesang Dorjee	F	22	GEO, Patshaling Gewog Adm.	"	Chuzomsa	17419929	
13.	Chabi kumar Rai	M	37	Gup	"	Pangthang	17867950	
14.	Pema Dorji Tamang	M	49	Tshogpa, Patshaling	"	Thathorling	17696339	
15.	Kezang Norbu	M	28	Agriculture In-charge	"	Pangthang	77755955	

page 2 of 3: Participants from Mendrelgang Gewog

Place: Mendrelgang

Date: 18/10/2023

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1	Tashi Dhendup	M		Mendrelgang	M/gang	Pemashong	17891806	
2	Pelden Lhamo	F			"	"		
3	Chundu Tshering			Tshogpa	"	"	17921933	
4	Tshewang Norbu	M		Mendrelgang CS	"	mendrelgang	17764791	
5	RIGZIN / TRINLEY	M	45	MENDRELGANG PS	M/GANG	PEMASHONG	17965880	
6	Tshering Choden	F		Tshogpa	"	Mendrelgang	17455394	
7	Karma	M		Mendrelgang (farmer)	"	"	17460691	
8	Jr. Wangdi	M		" (farmer)	"	"	17722252	
10	Sangay Pem	F		Tashipang (farmer)	"	Tashipang	17552635	
11	Tsagay	"		"	"	"	17801597	
12	Jigyen Wangmo	F		Tashipang (Tshogpa)	"	"	17515223	
12	Wangchuk	"		[illegible]	"	Resinbu	7822572	
13	Kin Choden	F		Resinbu	"	Resinbu	17678413	
~~14~~	~~Karma~~	~~M~~	~~56~~	~~M/Gang~~	~~"~~	~~M/Gang~~	~~17460691~~	
~~15~~	~~Jambay~~	~~"~~	~~44~~	~~"~~	~~"~~	~~"~~		
16	Santa Ram	M		Dzeecho	"	"	17765037	
17	Moni Lal	M		Dzeecho	"	"	17553073	
18	Sanjay Dorji	m		RNR.	"	"	17453392	
19	Yeshi	M	55	Resinzo	M/gang	Resinzo	yeshey@rinigang[illegible]	
20	~~Pema Dargay~~ Jambay Tshering	M		"	"	"	17306519	

page 3 of 3: Participants from Barshong Gewog

Place: Barshong Gewog

Date: 12/10/2022

No.	Name	Sex	Age	Address/Agency	Gewog	Chiwog/Village	Email/Contact	Signature
1	Mandhoj Tamang	M	33	B/toed ~~Barshong~~ (Tshogpa)	Barshong	B/toed	17765055	
2.	Bal Bdr. Dangee	M	62	Barshong toed	Barshong	B/toed	17842189	
3.	R B Chauhan	M	54	Livestock Ex / RNR	Barshong	Gewog Center	17795986	
4.	Bahman Tamang	M	53	Gangtokha (Tshogpa)	11	Gangtokha	17898755	
5.	Chandra Lal Tamang	M	51	Gangtokha	"	"	17921805	
6.	Phurpa Singh Tamang	M	57	"	"	"	77311995	
7.	Krishna M. Darjee	F	40	Barshong toed	"	B/toed	17503727	
8.	Harka Bdr. Subba	M	51	"	"	"	77269060	
9.	Ashman Dorji	M	59	Gangtokha	"	Gangtokha	77355773	
10.	Tara Bir Monger	M	34	Barshong toed	"	B/toed	17674377	
11.	Passang Lhamo	F	56	Gangtokha	"	Gangtokha	17442835	
12.	Aitaman Subba	M	37	Barshong toed	"	B/toed	17553583	
13.	Ram Bdr. Tamang	M	53	Gangtokha	"	Gangtokha	17634655	
14.	Chandra Kumar Pradhan	M	58	Barshong toed	"	B/toed	17636722	
15.	Rinzin Dorji Tamang	M	55	Mangmi B/shong	"	C/Kharay	77457045	
16.	Poma Lhamo	F	23	GAO, Barshong	"	-	17235731	
17	TASHI WANGCHEN	M	45	PRINCIPAL, BARSHONG PS	BARSHONG	B/MAED	17722488	
18.	Santa Lal Powdel	m	41	Gup, Barshong.	Barshong	B/maed	17634315	
19.	Tshering Deniang	m	29	Barshongtoed.	Barshong	B/toed.	77917682	

Verified

Gup.

Annex 3. Environmental Clearance

EC-1/3

ROYAL GOVERNMENT OF BHUTAN
TSIRANG DZONGKHAG
Environment Sector

TD/Env-06/2022/ 2253

March 30, 2022
4.04.2022

Environmental Clearance

In accordance with Section 34.1 of the Environmental Assessment Act 2000, the **Environmental Clearance (EC) is issued in favor Patshaling/Mendreigang/Rangthangling/Kilkhorthang/Tsholingkhar Gup for the construction of Khucchikhola integrated water supply scheme** with the following terms and conditions:

I. General

1. As per the Section 28.3 of the Regulation for the environmental Clearance of Projects, 2002, any modification of activity, including change in alignment, shall take place only with prior approval from District Environment Committee (DEC);

2. The holder shall ensure that construction of the water supply scheme is in line with the National Environment Protection Act 2007, Environmental Assessment Act 2000 and its Regulation 2002, Waste Prevention & Management Act of Bhutan 2009 and its Regulation 2012, the Water Act of Bhutan 2011;

3. The holder shall ensure compliance to all stake holder clearances at all times and shall be solely responsible for any dispute arising due to the construction of the channel;

4. The holder shall ensure that local residents/households, any religious, cultural, historic and ecologically important sites are not adversely affected by the construction and operation of the scheme;

5. The holder shall ensure that DEC and any other relevant authorities are informed of chance-find of any precious metals or minerals or articles;

6. The holder shall ensure that all disturbed areas along the project site are re-vegetated by adopting bioengineering techniques depending on the site conditions to minimize soil erosion and improve aesthetic value;

7. The holder shall ensure that felling of trees, if required, are done only upon obtaining approval from the Forest Division, Tsirang;

II. Environmental standards

8. The holder shall ensure that all project acctivities complies with the Environmental Standards 2010;

9. The holder shall ensure that Environmentally Friendly Construction techniques are adopted at all times;

III. Protection and management of water resources

10. The holder shall ensure that construction of the water supply scheme does not lead to blockage, storage or diversion of rivers, stream, irrigation channel, waterfall, underground water source or any other water resource or water course;

IV. Waste prevention and management

11. The holder shall ensure that no effluents or wastes of any kind from the construction activity are discharged into water sources or water bodies;

12. The holder shall ensure that littering is avoided at all times;

13. The holder shall ensure that excavated materials are never pushed downhill but dumped at the pre-identified /approved dumpsites;

14. The holder shall ensure that adequate trenches and barriers such as check dams, log barriers or boulder barriers are constructed at the spoil dumpsites and other required areas depending on the site condition prior to dumping and excavations;

V. Occupational Health and Safety measures

15. The holder shall ensure to post sentries at strategic location to avoid mishaps;

16. The holder shall ensure that adequate safety gadgets and outfits such as safety helmets, eye goggles, breathing masks, ear muffs, safety boots, etc. are provided to all workers and any other entering the work site;

17. The holder shall ensure that first aid kits are available at the site at all times;

18. The holder shall ensure that underage workers are not employed for the construction works;

VI. Implementation plan

19. The holder shall develop an implementation plan of all the terms and conditions of this EC within one month from the issue date;

20. The holder may adopt best practices in executing these terms and conditions to avoid adverse environmental impacts;

VII. Renewal and modification

21. The DEC may stop the activity or impose additional terms and conditions, as may be deemed necessary; and

22. The EC shall be subject to periodic review and modifications as per Article 25 of the EA Act 2000, without any liability on the part of the Royal Government;

TSIRANG

དཔལ་ལྡན་འབྲུག་གཞུང་།
རྩི་རང་རྫོང་ཁག།
ROYAL GOVERNMENT OF BHUTAN
TSIRANG DZONGKHAG
Environment Sector

23. The EC shall be renewed within one month from the expiry date:

Failure to comply with any of the above terms and conditions shall constitute an offence and the proponent shall be liable in accordance to the Environmental Assessment Act 2000 and/or existing environmental laws.

Validity:
This EC is valid for 24 months only from the issue date.

(Pema)
DZONGDAG

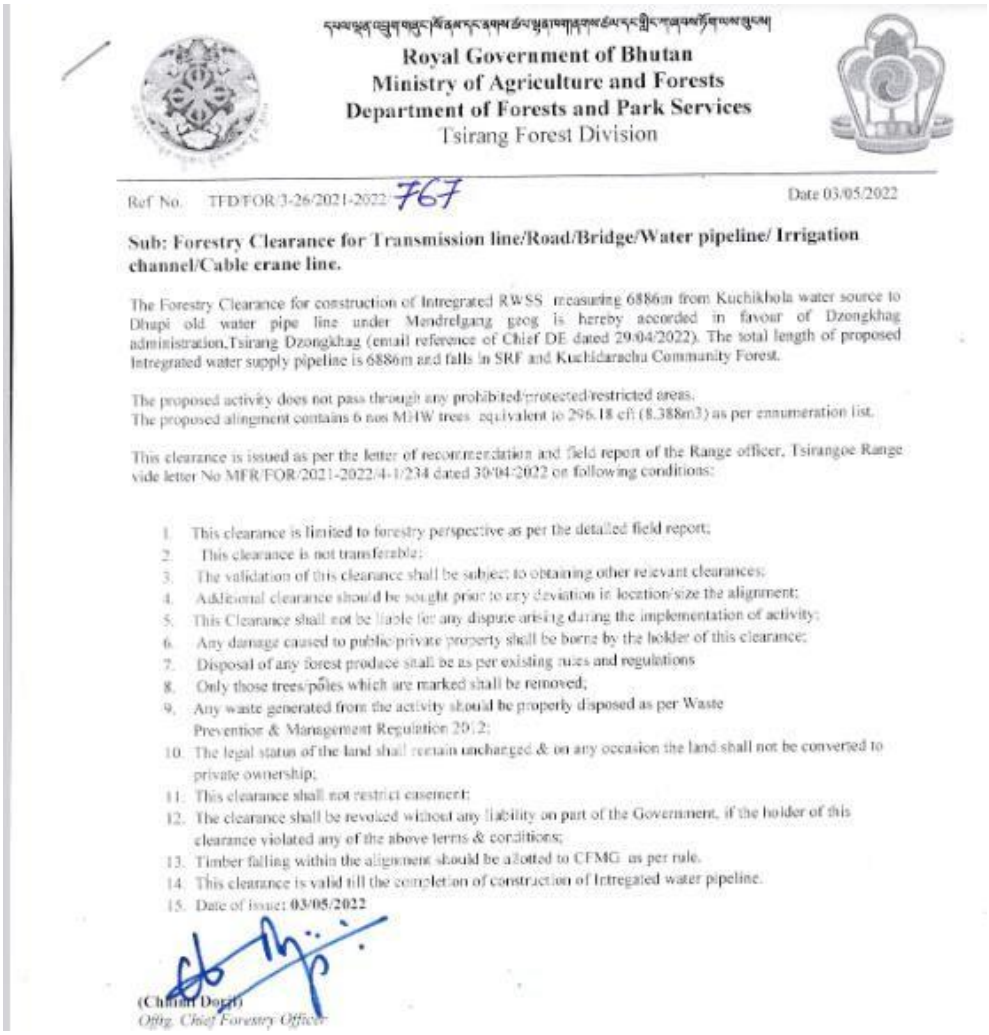
Royal Government of Bhutan
TSIRANG
Dzongkhag Administration

Copy to:

1. Chief Environment Officer, EACD, NECS, Thimphu for kind information

Annex 4. Forestry Clearances

1 of 2



Royal Government of Bhutan
Ministry of Agriculture and Forests
Department of Forests and Park Services
Tsirang Forest Division

Ref No. TFD/FOR/3-26/2021-2022/767 Date 03/05/2022

Sub: Forestry Clearance for Transmission line/Road/Bridge/Water pipeline/ Irrigation channel/Cable crane line.

The Forestry Clearance for construction of Intregrated RWSS measuring 6886m from Kuchikhola water source to Dhapi old water pipe line under Mendrelgang geog is hereby accorded in favour of Dzongkhag administration,Tsirang Dzongkhag (email reference of Chief DE dated 29/04/2022). The total length of proposed Intregrated water supply pipeline is 6886m and falls in SRF and Kuchidarachu Community Forest.

The proposed activity does not pass through any prohibited/protected/restricted areas.
The proposed alingment contains 6 nos MHW trees equivalent to 296.18 cft (8.388m3) as per ennumeration list.

This clearance is issued as per the letter of recommendation and field report of the Range officer, Tsirangoe Range vide letter No MFR/FOR/2021-2022/4-1/234 dated 30/04/2022 on following conditions:

1. This clearance is limited to forestry perspective as per the detailed field report;
2. This clearance is not transferable;
3. The validation of this clearance shall be subject to obtaining other relevant clearances;
4. Additional clearance should be sought prior to any deviation in location/size the alignment;
5. This Clearance shall not be liable for any dispute arising during the implementation of activity;
6. Any damage caused to public/private property shall be borne by the holder of this clearance;
7. Disposal of any forest produce shall be as per existing rules and regulations
8. Only those trees/poles which are marked shall be removed;
9. Any waste generated from the activity should be properly disposed as per Waste Prevention & Management Regulation 2012;
10. The legal status of the land shall remain unchanged & on any occasion the land shall not be converted to private ownership;
11. This clearance shall not restrict easement;
12. The clearance shall be revoked without any liability on part of the Government, if the holder of this clearance violated any of the above terms & conditions;
13. Timber falling within the alignment should be allotted to CFMG as per rule.
14. This clearance is valid till the completion of construction of Intregated water pipeline.
15. Date of issue: **03/05/2022**

(Chhimi Dorji)
Offg. Chief Forestry Officer

དཔལ་ལྡན་འབྲུག་གཞུང་། ནུས་ཤུགས་དང་རང་བཞིན་ཐོན་སྐྱེད་ལྷན་ཁག། ནགས་ཚལ་དང་གླིང་ཀ་ཞབས་ཏོག་ལས་ཁུངས།
ནགས་ཚལ་ལྟ་རྟོག་དང་བདག་དོན་སྡེ་ཚན།

Royal Government of Bhutan

Ministry of Energy & Natural Resources

Department of Forests & Park Services

Application ID: **704315**

16 November 2023

FORESTRY CLEARANCE FOR WATER PIPELINE

This forestry clearance is issued for **Water Pipeline** measuring **34,459.50 m X 1.00 m** under **Mendrelgang** Gewog, **Tsirang** Dzongkhag for the following applicant:

Name	CID	Household Number	Thram Number	Village	Gewog	Dzongkhag
Dzongkhag Engineer						

The proposed area contains:

Trees	
Species	**Volume**
Castanopsis hystrix	5.39 m3

Therefore, this clearance is **issued** based on the field inspection report submitted by: **[Gempa (Sr. FR I)]** dated **15 Nov 2023** on the following conditions:

General Terms and Conditions

1. This clearance is issued from the forestry perspective only.
2. Department of Forest and Park Services shall not be responsible for any dispute arising during the implementation of the activity.
3. This clearance is not transferable.
4. This clearance shall not restrict easement.
5. The validation of this clearance is subject to obtaining other relevant clearances.
6. Additional clearance should be sought before any deviation in the location/alignment/size of the proposed State-Reserved Forest land (SRFL).
7. Any damage caused to public/private life and property shall be borne by the clearance holder.
8. Any waste generated from the activity should be properly disposed of as per the existing Waste Prevention & Management Regulations.

Reservations:

1. DoFPS may impose additional terms and conditions as may be deemed necessary
2. The clearance shall be revoked without any liability on part of DoFPS if the holder of this clearance violates any of the above terms and conditions.

This is an electronically generated document. No signature(s) required. Document generated on 16 November 2023 at 10:55 AM.

Annex 5. Road Clearance

1 of 5

དཔལ་ལྡན་འབྲུག་གཞུང་། གཤིན་རྗེས་ས་གནས་དང་སྐྱེལ་འདེབས་ལས་གྲུབ་ཁག།
འཕྲིན་འགྱུལ་སྐྱེལ་འདེབས་ལས་གྲུབ།

Royal Government of Bhutan
Ministry of Infrastructure and Transport
Department of Surface Transport
Regional Office: Sarpang.

DoST/ROS/2023-2024/Mtc-16/ 548 **Dated: 19-12-2023**

The Executive Engineer

Damphu Sub-Division

Tsirang

Sub: Road Clearance

Sir,

Enclosed please find herewith the road clearance for the applicant duly approved by RO, DoST, Sarpang based on the recommendation submitted by your office. Please make sure that RI and site engineer shall strictly monitor timely for compliance as per the terms and condition.

Thanking you

(Sonam Tashi)
CHIEF ENGINEER

Copy to:

1. Dasho Dzongdag, Dzongkhag administration Tsirang for kind information
2. Road inspector for necessary action and followup.
3. Office copy

དཔལ་ལྡན་འབྲུག་གཞུང་། གཞི་རྟེན་མཐོ་ཆས་དང་སྐྱེལ་འདྲེན་ལྷན་ཁག།
འགྲོ་འགྲུལ་སྐྱེལ་འདྲེན་ལས་ཁུངས།

Royal Government of Bhutan
Ministry of Infrastructure and Transport
Department of Surface Transport
Regional Office: Sarpang.

Date: 19-12-2023

ROAD CLEARANCE

AGREEMENTS

The Dzongkhag Administration, Tsirang Dzongkhag has approached the Regional Office, Departments of Surface Transport, Sarpang, for seeking clearance for the water pipeline installation along Wangdue-Gelephu at Raksheydangdra (Ch.9.6km). The Regional office hereby has approved the water pipeline installation as per the decision of committee from Regional office sarpang, Damphu Sub-division and officials from Dzongkhag Administration. The approval is accorded based on the agreement by the applicant to the following conditions, which if breached shall lead to revocation of agreement and levy of penalties as per the Road Act 2013 and Road Rules and Regulations 2016.

1. The new water pipeline should be laid beyond the road shoulder with cement concrete to the existing water pipeline and the pipeline should be laid from the valley side of Road.
2. Any damages to the structures like private properties, any other properties such as Road, buildings, monuments has to be restored to the original shape by the applicant on its own cost.
3. While trenching or laying of pipes, the traffic movement through Highway should not be disrupted.
4. When the highway is improved or widened at the later stage, if a water pipeline gets damaged during the improvement in near future, the cost shall not be borne by DoST but shall be borne by applicant. The DoST has the right to ask your Office to relocate the pipeline without any compensation.
5. The applicant should not construct any additional Permanent structure within RROW.
6. The applicant shall ensure safe flow of traffic on the existing road.
7. No materials shall be dumped within the formation width of the existing road for safety reasons. In the case of debris being dumped on the existing road, the same shall be cleared off at the end of the same day, if not the applicant/owner should bear the fines and penalties as per our Act 2013 & Rules and Regulation 2016.
8. In case any defect comes to the road by bursting of water pipe lines, the applicant/owner is accountable for restoration of road infrastructure.

Dzongkhag Administration
Tsirang
Receive on 20/12/23
File on 14
Initial

དཔལ་ལྡན་འབྲུག་གཞུང་། གཞི་རྟེན་མཁོ་ཆས་དང་སྐྱེལ་འདྲེན་ལྷན་ཁག།
འགྲོ་འགྲུལ་སྐྱེལ་འདྲེན་ལས་ཁུངས།
Royal Government of Bhutan
Ministry of Infrastructure and Transport
Department of Surface Transport
Regional Office: Sarpang.

9. The water pipeline crossing through the culvert should be laid at the site with cement concrete to avoid any destruction in future.
10. The clearance is valid till one year (1yrs) from the date of issued
11. Cautionary signage should be displayed during the construction period.
12. Applicants shall get clearance from other agencies before implementation of this approval.
13. The Department of road shall reserve the right to revoke this clearance if the applicant fails to fulfill any Pre-conditions stated above.

Executive Engineer, Damphu Sub Division, DoST shall ensure that the conditions stated above are adhered to by the applicant during the time of implementation.

Dzongdag
Dzongkhag Administration
Tsirang

(CHIEF ENGINEER)

DoST, Regional Office

Sarpang

BHUTAN NU 10

(SONAM)

Dasho Dzongdag, Dzongkhag Administration Tsirang

Witness of Chief Engineer

Name: Prakash Sharma

CID no: 11209000122

Witness of Applicant

Name: Jampel Dorji

CID no: 11102006655

དཔལ་ལྡན་འབྲུག་གཞུང་།
རྫོང་ཁག་བདག་སྐྱོང་། རྩི་རང་།
ROYAL GOVERNMENT OF BHUTAN
DZONGKHAG ADMINISTRATION, TSIRANG

TD/PLAN/01/2023-24/ 2028 November 12, 2023

Chief Engineer
Department of Road
Regional Office: Sarpang

Office of the Chief Engineer
MoIT,DoST, RO,Sarpang
Dairy No. 569
Date. 12/12/23.

Subject: Seeking Clearance

Sir

The Dzongkhag Administration, Tsirang Dzongkhag has received a grant under the Advancing Climate resilience of the Water sector in Bhutan (ACREWAS) project. This project will cater drinking water supply to Six Gewogs (Mendrelgang, Barshong, Patshalling, Rangthaling, Tsholingkhar and Kilkhorthang). The alignment of the pipelines will be laid over the existing Municipal water supply line and there is no new cutting required for the project.

For this the Administration will be highly grateful if we could get the clearances at the earliest as the budget has been released and we would like to float the tenders at the earliest.

Looking forward to the same cooperation, please.

Yours Sincerely

(Sonam)
DZONGDAG

EE-cum/AE/RI
Pl. discuss on this and further seek advice from HQ if necessary
12/12

དཔལ་ལྡན་འབྲུག་གཞུང་། གཞི་རྟེན་སྒྲིག་ཆས་དང་སྐྱེལ་འདྲེན་ལྷན་ཁག།
འགྲོ་འགྲུལ་སྐྱེལ་འདྲེན་ལས་ཁུངས།

Royal Government of Bhutan
Ministry of Infrastructure and Transport
Department of Surface Transport
Regional Office: Sarpang

DoST/ROS/DS/2023-2024/158

Dated: 14th December 2023

Site inspection report

As per letter No.TD/Plan/01/2023-2024/2028, dated 12.11.2023 of Tsirang Dzongkhag Administration, on dated 13.12.2023 following officials were present for physical site verification. The location falls on Wangdue-Tsirang Primary National Highway (Ch.98.6km to 99.3km, place call Raksheydangdra)

1. Mr. Sonam Tashi, Chief Engineer, RO, DoST, Sarpang
2. Mr. Kintu, Chief Engineer, Dzongkhag Administration, Tsirang.
3. Mr. Sonam, Engineer, Dzongkha Administration, Tsirang.
4. Mr. Karma Tenzin, Road Inspection, DoST, Sarpang.
5. Mr. Cheten Tshering, EE, Damphu Sub Division.

During the site visit, Chief Engineer, Tsirang Dzongkhag, explain the committee about scarcity of drinking water at Damphu town and other six Gewogs, under Tsirang Dzongkhag. Because of fact, with so much difficulty, Government managed to get Grant from Advance Climate resilience of the water sector in Bhutan. Therefore, to start the work clearance from DoST is needed, since it falls within RRoW and there is no other alternative in that particular location.

With above reasons mentioned, Chief Engineer, RO, DoST, Sarpang accepted the clearance with certain conditions, like if there is any damages or interruption of water supply due to road widening or improvement of Highways, it is responsibility of Dzongkhag Administration to repair, reconnections or shifting and DoST will not held any responsibility.

The committee agreed to issue the road clearance from Regional office.

Chief Engineer, RO, Sarpang

Road Inspector, sarpang

EE, Damphu Sub Division.

Office of the Chief Engineer
MoIT,DoST, RO,Sarpang
Dairy No. 601
Date 19/12/23

Annex 6. Clearance from CFMG

1 of 4

(No objection) Date:- 22/04/2022.

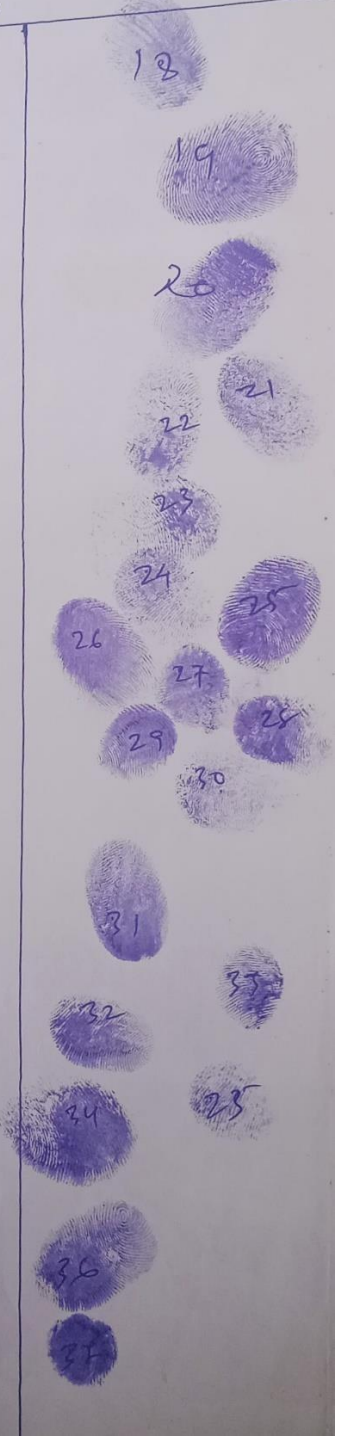
We the undersigned members of Thakthaling and Khuchi-Darachu Community forest (CF) under Thakthaling Chiwog, Patshaling, do hereby issue this NO OBJECTION/CLEARANCE for the Operation of Water Connection through our Community Forest (CF) under Water flagship project to be executed by the Drangkhag Admn. in Collaboration with relevant stakeholders for other Six Gewogs of the drangkhag and thromde too on the Condition to facilitate our Chiwog with a provision to have an outlet at the Source tank with Water Connection to our Chiwog as stated in our earlier's documentation. Having issued, we won't object for same in later stage under the Condition of fulfilling our demand as stated.

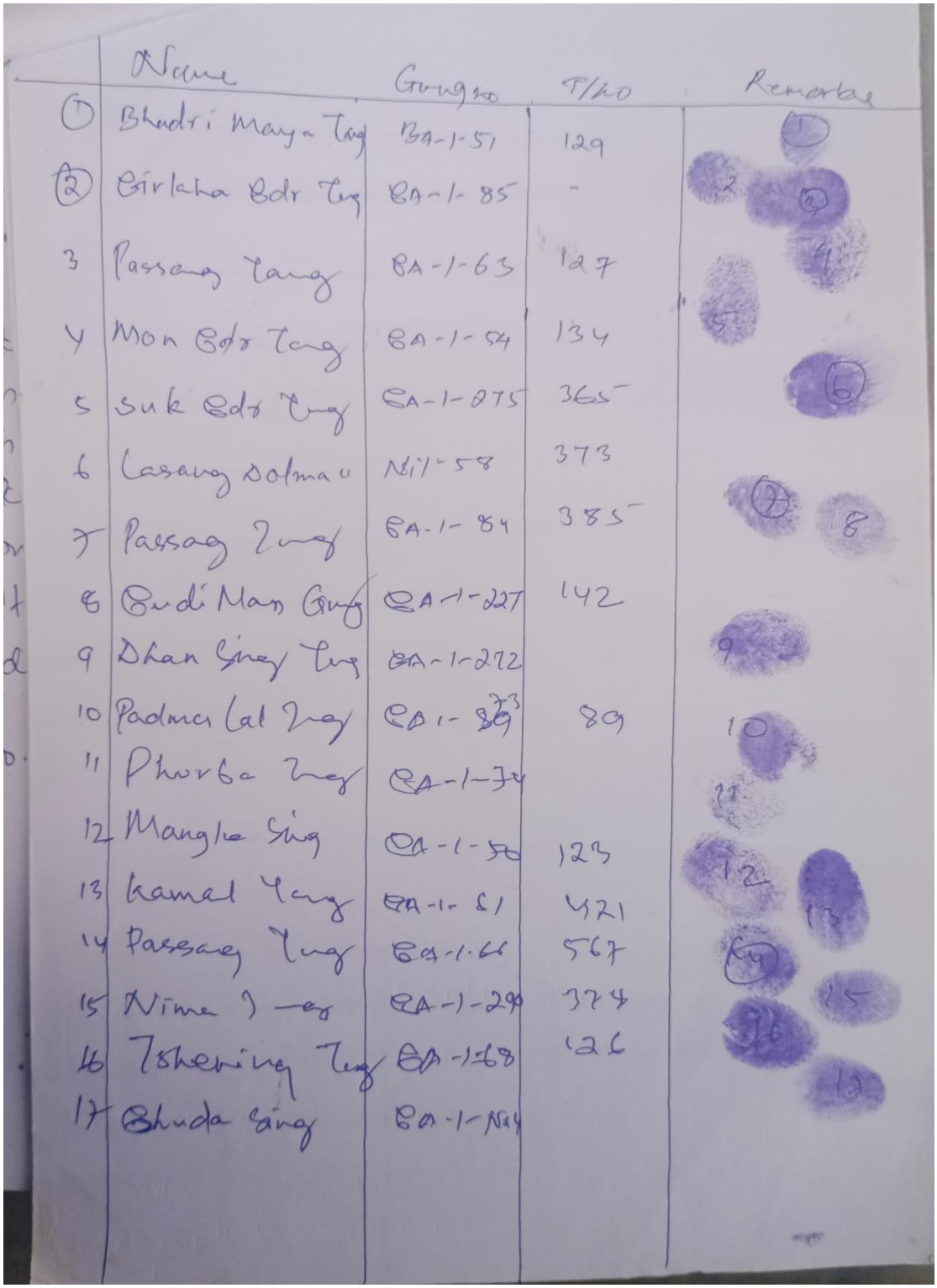
Sl. No. Name of the members;-

01. Dawa Tamang
02. Ganesh Sunwar 22/4/22
03. Deo Bdr. Tamang 22/04/2022
04. Tshering Wangdi 22/04/22

Thakchorling c.f. Dt. 22/04/22.

	Name	Gung no	T/no	Remarks
18	Dil Maya Tmg	Ba-1-90	426	
19	Dawa Tamang	Ba-1-267		
20	Gina Maya Tmg	Ba-1-48		
21	Meg Raj Tamang	Ba-1-304	217	
22	Prem bdr Tamang	Ba-1-231	362	
23	Bir bdr ~~Tamang~~	Ba-1-57	136	
24	~~Bhu~~. Buelhi Maya "	Ba-1-Nil58	372	
25	Suk bir Tmg.	Ba-1-234	384	
26	Santa bir Tmg.	Ba-1-54	132	
27	Dhoj Man Tmg.	Ba-1-~~476~~ 268	416	
28	Passang Tmg	Ba-1-232		
29	Rabi Lal Tmg.	Ba-1-271	36	
30	Dil Bdr Tmg.	Ba-1-71		
31	Prem Dorji Tmg.	Ba-1-77	-125	
32	Suk Maya Lama	Ba-1-86	440	
33	Phurba Lama	Ba-1-86		
34	Naina Singh Tmg.	Ba-1-243	287	
35	Karma Singh Tmg.	Ba-1-238		
36	Ram Bdr Tmg	Ba-1-53	131	
37	Bir bdr Tmg.	Ba-1-78	125	





	Name	Gungso	T/no	Remarks
1	Bhudri Maya Tag	BA-1-51	129	
2	Girlaha Bdr Tag	BA-1-85	-	
3	Passang Tang	BA-1-63	127	
4	Mon Bdr Tang	BA-1-54	134	
5	Suk Bdr Tag	BA-1-075	365	
6	Lasang Dolma U	Nil-58	373	
7	Passag Tang	BA-1-84	385	
8	Budi Man Gung	BA-1-227	142	
9	Dhan Sing Tag	BA-1-272		
10	Padma Lal Tag	BA-1-273	89	
11	Phurba Tag	BA-1-74		
12	Mangla Sing	BA-1-50	123	
13	Kamal Tang	BA-1-81	421	
14	Passang Tag	BA-1-66	567	
15	Nima Tsering	BA-1-29	374	
16	Tshering Tag	BA-1-68	126	
17	Bhuda Sing	BA-1-84		

Khuchi Darachu CFMG 22/4/2022

1	Ganesh Sunwar	Bal. 219	198	
2	Tshering wangdi Sherpa	Bal. 08	11	
3	Bal Bir Rai	Bal. 55	116	
4	Lhamo sherpa	Bal. Nil/95	213	
5	Chandra Lal Sunwar	Bal. 87		C.H.S
6	Kamal Bdr Sunwar	Bal. 76	114	
7	Sonam Dorji Sherpa	Bal. 08		
8	Jhari Lal Sunwar	Bal. 88		
9	Ham Raj Rai	Bal. 89		
10	Bhuddi Maya Rai	Bal. 89		
11	Chandra Bdr Sunwar	Bal. 222	196	
12	Mon Bdr Sunwar	Bal. 81		
13	Tshering Dorji Sherpa	Bal. 37	18	

No Objection

We, the chairperson and members of **Chirphen** community forest, would like to provide clearance (no objection) for the outlaying of pipes and any other activities related to the ACREWAS water project within our community forest.

Sl No	Name	CID No.	Signature
1	Dhan Bdr Gurung	11806001531	
2	Davi Maya Gurung	11806001547	
3	Mon Bdr. Gurung	11806001561	
4	Kashar Bdr. Gurung.	11806001573	
5	Pamsa Tshering Tamang	11806003999	
6	Nim Dorji	11806001413	
7	Dotan	11806001516	
8	karma Yangzom / (C/o Sharab jamtsho)	11504000349	
9	Wangmo	11806001448	
10	Pem dorji Tamang	11806000401	
11	Gamso Dorji	~~11806000401~~ 11806000553	
12	Bishnu Maya Tamang	11806000406	
13	Ghe Bdr Subba ~~Chodon~~	11802001785	
14	Ram Bdr Monger ~~Karma Choida~~	11806000765	

No Objection

We, the chairperson and members of Chirphen community forest, would like to provide clearance (no objection) for the outlaying of pipes and any other activities related to the ACREWAS water project within our community forest.

Sl No	Name	CID No.	Signature
15	Tshewang Lhamo	11800006 20	
16	Chodan	11806000666	
17	Ngazom	12005001759	
18	Chaki Wangmo	11806000732	
19	Jamtsho	11806000776	
20	Yeshi Lhamo	11806000807	
21	Dorji Tshomo	10903002743	
22	Birkha Bdr. Tamang	11806000386	
23	Bal Bdr. Dorjee	11810009 07	
24	Dhan Bdr. Dorjee	11801000906	
25	A Suk Bdr. Subba		
26	Dhan Bdr. Bhujel	11801000829	
27	Aita Tilchan Bhujel	31806000047	
28	Tara Bir Darjee	11806001301	

Verified

Secretary
Chirphen Community Forest
Mendrelgang, Tsirang

(Magraj Gurung)
11806019159

Chairman
Chirphen Community Forest
Mendrelgang, Tsirang

11506002035

2/2

No Objection

We, the chairperson and members of **Thuenpa Puenzhi** community forest, would like to provide clearance (no objection) for the outlaying of pipes and any other activities related to the ACREWAS water project within our community forest.

Sl No.	Name	CID No.	Signature
1	Lal Bdr Bhujel	11801000632	
2	Tara Bir monger	11801000492	
3	Chardka Bdr mongar	11801000516	
4	Hardka Bdr mongar	11801000515	
5	Ran Singh mongar	11801000500	
6	Durga Bdr mongar	11801000505	
7	Chandrakumar Timsena	11801000519	
8	Pem Dorji Tamang	11801000540	
9	Nima Tshering Tamang	11801000195	
10	Dhan Bdr Bhujel	11801000629.	
11	Mongal Singh Subba	11809001810	
12	Ram Poudel	11801000581	
13	Nedra Bdr Luitel	11801000557	
14	Kharka Bdr Poudel	11801000583	

ཚེག་མེད་ཡི་ཀྱ། ཟླ་ཚེས་༡༠/༡༠/༢༠༢༣

དཔལ་འབྱོར་གྲོང་ཁྱེར་སྤྱི་འཛིན་ནས་ མཁན་གསལ་ལྟར་གྱི་མི་དངམ་ཚུགཔ་ནས་ ས་གནས་ཁུ་གཅིག་ལ་ཟེར་ས་ལས་ མན་དུལ་སྒང་ཚེད་འོག་གི་མི་གསེར་ཚུག་གི་དོན་ལས་འཐུང་ཚུ་འཐོན་ཡོད་པའི་ཚུ་དུང་འདི་ དཔལ་གྱི་འགྲོ་སྐྱོང་ཚོགས་ཚུ་ནས་ནང་ལས་འབད་སའི་དོན་ནང་བཙུགས་ཏེ་འབག་མི་ལུ་ ཚེག་ཤེས་པུ་རུམ་ཡང་མེད་ཟེར་ཚེག་མེད་ཡི་ཀྱ་སྤུལ་བ་མཚེན།

ཨངཔ།	མིང་ཐོག་ཁ་གསལ།	འགྲུལ་འཕྲིན་ཨངཔ།	རྟགས།
1	Dhan bdr Tamang	17640536	
2	Kharkha bdr Tamang	17261268	
3	Til bdr Tamang	17277934	
4	Thuk Tan lama	17742375	
5	Dothan	17915602	
6	Pema Tamang	17615801	
7	Dawang Tamang	16900102	
8	Vayen Wangmo	17515223	
9	Sangay Lhamo	17928223	
10	Yeshi Namgay	17843018	
11	Chimi Dorji	17856907	
12	Dhan Bdr Biswi	17635287	
13	Man Bir Biswi	17767069	
14	Amber bdr gurung	17331266	
15	Jit bdr gurung	17653339	
16	Hemenka gurung		
17	Dorji Gyeltshen	17878129	

Mangmi
Thrimshing Gewog Administration
Tsirang Dzongkhag

ཚོགས་མེད་ཡི་ཀླུ། ཟླ་ཚེས་ ༡༠/༡༠/༢༠༢༣

དཔལེན་དེ་ནས་ དབཅས་བཀྲིས་སྒང་ཀྱི་འོག་ནས་ མཁན་གསལ་ཁྱད་ཀྱི་མི་ངོམ་རྒྱག་ནས་ས་གནས་ཁུ་གཅོ་ཁོ་ལ་ཟེར་ས་ལས་ མན་དལ་སྐང་ཆེད་འོག་ཀྱི་མི་གསེར་རྒྱག་ཀྱི་དོན་ལས་འཐུང་རྒུ་འཕོན་ཡོད་པའི་རྒྱུ་དུང་འདི་ དབཅས་ཀྱི་འཚོང་ལེ་ནས་ས་ཐལ་ནང་ལས་འབད་སའི་དོང་ནང་བརྒྱག་ཏེ་འབག་མི་ལུ་ ཚོགས་ཤེས་པ་རྣམས་ཡང་མེད་ཟེར་ཚོགས་མེད་ཡི་ཀླུ་ཐུལ་བ་མཁྱེན།

ཨངྐ།	མིངཐོག་ཁ་གསལ།	འགྲུལ་འཕྲིན་ཨངྐ།	རྟགས།
18	Rinchen chogay	17753858	
19	Man Bdr gurung	17915716	
20	chandra Bdr gurung	17634864	
21	It Dik mukhia	17613493	
22	Mondjosh mukhia	17657177	
23	karma Gyeltshen	17658698	
24	NaWang Tshering	17941990	
25	Tshering	17804874	
26	Kinley	17806988	
27	Til bdr gurung	17615361	
28	Dhan bdr gurung	17620260	
29	Dheminty gurung	17331265	
30	It Bik gurung	17604283	
31	It Bim gurung	17411266	
32	Nim Dorji	17509098	
33	karma Dema	17557574	
34	sonam Dorji	17437522	
35	Wangmo	17460362	
36	Tendel Zangmo	17605387	
	Tuka Der gurung	17501953	T. D G

Mangm
Tsirang Dzongkhag

Annex 7. Results of the Water Quality Test

དཔལ་ལྡན་འབྲུག་གཞུང་།
གསོ་བ་སྨན་ཁག།
ཐིམ་ཕུ།

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF HEALTH
DEPARTMENT OF PUBLIC HEALTH
Royal Centre for Disease Control
Serbithang, Thimphu-BHUTAN
P.O BOX: 667

Drinking Water Quality Testing Laboratory Result

Damphu Hospital : Tsirang

Other Surveillance Report

Record #	AREC_001782	Test Requested By	*Chief Dzongkhag Engineer*
Collected By	*District Engineer*	Collection Date & Time	*2023-11-17 10:44:53*
Analyzed By	*Anand Lepcha*	Analysis Date & Time	*2023-11-17 13:45:11*

Sampling Point : **kuchi khola 1**	Source : **River Water**	Acceptable Value
Chlorine (Residual)(mg/L)	*0.00*	0.2 - 0.5
Colour(TCU)	*Non-objectionable*	*Unobjectionable*
Conductivity(us/cm)	*37.9*	*0 - 1000*
Odour()	*Non-objectionable*	*Unobjectionable*
pH()	*6.7*	*6.5 - 8.5*

དཔལ་ལྡན་འབྲུག་གཞུང་།
གསོ་བ་སྨན་ཁག།
ཐིམ་ཕུ།

ROYAL GOVERNMENT OF BHUTAN
MINISTRY OF HEALTH
DEPARTMENT OF PUBLIC HEALTH
Royal Centre for Disease Control
Serbithang, Thimphu-BHUTAN
P.O BOX: 667

Thermotolerant Coliform(CFU/100mL)	*04*	0
Turbidity(NTU)	*3.37*	0 - 5
Sampling Point : **kuchi khola 2**	Source : **River Water**	Acceptable Value
Chlorine (Residual)(mg/L)	*0.00*	0.2 - 0.5
Colour(TCU)	*Non-objectionable*	*Unobjectionable*
Conductivity(us/cm)	*22.0*	*0 - 1000*
Odour()	*Non-objectionable*	*Unobjectionable*
pH()	*6.8*	*6.5 - 8.5*
Thermotolerant Coliform(CFU/100mL)	*02*	0
Turbidity(NTU)	*2.06*	0 - 5

Remarks :

AV : Acceptable Value Printed By : Probin.yonzon65@gmail.com on 2023-11-22

Anand Lepcha
Lab. Technician
EID: 202009918011

- 2 - | Water Quality Monitoring Information System | [illegible] | www.rcdc.gov.bt

Annex 8. Biodiversity list

Table 1. Flora species recorded during the field visit

#	Species name	Family name	Habit
1	*Acer oblongum*	Sapindaceae	Evergreen
2	*Alnus nepalensis*	Betulaceae	Decidous
3	*Betula alnoides*	Betulaceae	Decidous
4	*Castanopsis hystrix*	Fagaceae	Evergreen
5	*Daphniphyllum himalense*	Daphnephyllaceae	Evergreen
6	*Engelhardia spicata*	Juglandaceae	Evergreen
7	*Eurya acuminata*	Pentaphylacaceae	Evergreen
8	*Exbucklandia populnea*	Hamamelidaceae	Evergreen
9	*Lithocarpus elegans*	Fagaceae	Evergreen
10	*Lyonia ovalifolia*	Ericaceae	Decidous
11	*Michelia doltsopa*	Magnoliaceae	Evergreen
12	*Myrica esculenta*	Ericaceae	Evergreen
13	*Myrsine capitellata*	Myrisinaceae	Evergreen
14	*Persea duthiei*	Lauraceae	Evergreen
15	*Schima wallichii*	Theaceae	Evergreen
16	*Sloanea dasycarpa*	Elaeocarpaceae	Evergreen
17	*Symplocus ramosissima*	Symplocaceae	Evergreen
18	*Dichroa febrifuga*	Hydrangeaceae	Shrub
19	*Symplocus sumuntia*	Symplocaceae	Shrub
20	*Trevesia palmata*	Araliaceae	Shrub
21	*Viburnum erubescens*	Adoxaceae	Shrub
22	*Ardisia macrocarpa*	Primulaceae	Shrub
23	*Plectocomia himalayana*	Aracaceae	Shrub
24	*Symplocos paniculata*	Symplocaceae	Shrub
25	*Syzygium cumini*	Myrtaceae	Shrub
26	*Bambusa spp*	Poaceae	Shrub
27	*Luculia gratissima*	Rubiaceae	Shrub
28	*Smilax spp*	Smilacaceae	Shrub
29	*Thysanolaena latifolia*	Poaceae	Shrub
30	*Callicarpa rubella*	Lamiaceae	Shrub
31	*Cinnamomum glaucescens*	Lauraceae	Shrub
32	*Boehmeria spp*	Urticaceae	Shrub
33	*Zanthoxylum armatum*	Rutaceae	Shrub
34	*Daphne suriel*	Thymelaeaceae	Shrub
35	*Macaranga denticulata*	Euphorbiaceae	Shrub
36	*Melastoma malabathricum subsp. normale*	Melastromataceae	Shrub

37	*Polygala arillata*	Polygonaceae	Shrub
38	*Edgeworthia gardneri*	Thymelaeaceae	Shrub
39	*Lindera spp*	Lauraceae	Shrub
40	*Murraya koenigii*	Rutaceae	Shrub
41	*Rhus spp*	Anacardiaceae	Shrub
42	*Maesa chisia*	Primulaceae	Shrub
43	*Adenostemma lavenia*	Asteraceae	Herb
44	*Aeginetia indica*	Orbanchaceae	Herb
45	*Ageratum conyzoides*	Asteraceae	Climber
46	*Alchemilla spp*	Rosaceae	Herb
47	*Arisaema spp*	Araceae	Herb
48	*Begonia spp*	Begoniaceae	Herb
49	*Bidens pilosa*	Asteraceae	Herb
50	*Cyanotis vaga*	Commelinaceae	Herb
51	*Dioscorea spp*	Dioscoreaceae	Climber
52	*Diplazium esculentum*	Athyriaceae	Fern
53	*Elatostema lineolatum*	Urticaceae	Herb
54	*Eria coronaria*	Orchidaceae	Orchid
55	*Eupatorium adenophorum*	Asteraceae	Herb
56	*Girardinia diversifolia*	Urticaceae	Herb
57	*Hedychium spp*	Zingibaraceae	Climber
58	*Hoya spp.*	Apocynaceae	Epiphyte
59	*Impatiens spp*	Balsaminaceae	Herb
60	*Papilionanthe spp*	Orchidaceae	Orchid
61	*Persicaria spp*	Polygonaceae	Climber
62	*Phalaenopsis spp*	Orchidaceae	Orchid
63	*Pilea spp*	Urticaceae	Herb
64	*Piper longum*	Piperaceae	Herb
65	*Plagiogyria communis*	Plagiogyriaceae	Herb
66	*Polystichum spp*	Dryopteridaceae	Fern
67	*Pouzolzia hirta*	Urticaceae	Herb
68	*Prunella vulgaris*	Lamiaceae	Herb
69	*Pteridium aquilinum*	Pteridaceae	Herb
70	*Pteris wallichiana*	Pteridaceae	Herb
71	*Rhaphidophora decursiva*	Araceae	Climber
72	*Rubia manjith*	Rubiaceae	Climber
73	*Rubus ellipticus*	Rosaceae	Herb
74	*Selaginella spp*	Selaginaceae	Herb
75	*Setaria palmifolia*	Poaceae	Herb
76	*smilax*	Smilacaceae	Climber
77	*Strobilanthes spp*	Acanthaceae	Herb

78	*tetrastigma serrulatum*	Vitaceae	Climber
79	*Tupistra wattii*	Asparagaceae	Herb
80	*Urtica dioica*	Urticaceae	Herb
81	*zuixine spp*	Orchidaceae	Orchid

Table 2. Avifauna recorded during the field visit

#	Common name	Scientific name	IUCN Status	FNCA 2023
1	Ashy Drongo	*Dicrurus leucophaeus*	LC	
2	Barred Cuckoo-dove	*Macropygia unchall*	LC	
3	Bay woodpecker	*Blythipicus pyrrhotis*	LC	
4	Black Drongo	*Dicrurus macrocereus*	LC	
5	Black -Throated Sun bird	*Aethopyga saturata*	LC	
6	Black Eagle	*Ictinaetus malaiensis*	LC	
7	Blue-fronted Redstart	*Phoenicurus frontalis*	LC	
8	Blue-throated Blue-flycatcher	*Cyornis rubeculoides*	LC	
9	Blue Whistling-thrush	*Myophonus caeruleus*	LC	
10	Blue-winged Minla	*Siva cyanouroptera*	LC	
11	Brown dipper	*Cinclus pallasii*	LC	
12	Chestnut-crowned Laughingthrush	*Trochalopteron erythrocephalum*	LC	
13	Common green Magpie	*Cissa Chinensis*	LC	
14	Common Tailorbird	*Orthotomus sutorius*	LC	
15	Crimson sunbird	*Aethopyga siparaja*	LC	
16	Crimson-breasted Woodpecker	*Dryobates pernyii*	LC	
17	Eurasian Sparrowhawk	*Accipiter nisus*	LC	Schedule III
18	Golden Babbler	*Cyanoderma chrysaeum*	LC	
19	Great Barbet	*Psilopogon virens*	LC	
20	Great Hornbill	*Buceros bicornis*	V	Schedule II
21	Green-backed Tit	*Parus monticolus*	LC	
22	Grey Bushchat	*Saxicola ferreus*	LC	
23	Grey-cheeked Warbler	*Phylloscopus poliogenys*	LC	
24	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	LC	
25	Grey Treepie	*Dendrocitta formosae*	LC	
26	Grey Wagtail	*Motacilla cinerea*	LC	
27	Grey-backed shrike	*Lanius tephronotus*	LC	
28	Grey-Hooded Warbler	*Phylloscopus xanthoschistos*	LC	
29	Hill Partridge	*Arborophila torqueola*	LC	Schedule III
30	Hill Prinia	*Prinia superciliaris*	LC	
31	Large Hawk-cuckoo	*Hierococcyx sparverioides*	LC	Schedule III
32	Lesser Necklaced Laughingthrush	*Garrulax monileger*	LC	
33	Little Pied Flycatcher	*Ficedula westermanni*	LC	
34	Mountain Imperial-pigeon	*Ducula badia*	LC	

35	Nepal Fulvetta	*Alcippe nipalensis*	LC	
36	Olive-backed Pipit	*Anthus hodgsoni*	LC	
37	Oriental Turtledove	*Straptopelia orientalis*	LC	
38	Pale Blue flycatcher	*Cyornis unicolor*	LC	
39	Pale-chinned Flycatcher	*Cyornis poliogenys*	LC	
40	Plumbeous Water-redstart	*Phoenicurus fuliginosus*	LC	
41	Red-billed Leiothrix	*Leiothrix lutea*	LC	
42	Red-tailed Minla	*Minla ignotincta*	LC	
43	Red-Vented Bulbul	*Pycnonotus cafer*	LC	
44	Rofous sibia	*Heterophsia capistrata*	LC	
45	Rosy pipit	*Anthus roseatus*	LC	
46	Rufous-throated Wren-babbler	*Spelaeornis caudatus*	NT	Schedule III
47	Rufous-winged Fulvetta	*Schoeniparus castaneceps*	LC	
48	Rusty-cheeked Scimitar-babbler	*Erythrogenys erythrogenys*	LC	
49	Speckled Woodpigeon	*Columba hodgsonii*	LC	Schedule III
50	Striated Bulbul	*Alcurus striatus*	LC	
51	Tickell's Leaf-warbler	*Phylloscopus affinis*	LC	
52	Verditer Flycatcher	*Eumyias thalassinus*	LC	
53	Wedge-tailed Green-pigeon	*Treron sphenurus*	LC	
54	White-capped Water-redstart	*Chaimarrornis fuliginosus*	LC	
55	White-crested Laughingthrush	*Garrulax leucolophus*	LC	
56	White-tailed Nuthatch	*Sitta himalayensis*	LC	
57	White-throated Laughingthrush	*Pterorhinus albogularis*	LC	
58	White-throated Fantail	*Rhipidura albicollis*	LC	

Annex 9. Discharge Data for Khuchi Khola

Name of Work: Construction of water supply (Six Gewogs)
Dzongkhag: Tsirang
Funded: Water Flagship Program(GCF/UNDP)
Particular: Water Discharge Data(Source- Khichukhola,Stream)

sl#	Width of stream(m)	Width (m)	Average width(m)	Unit
1	Width 1	1.2		
	Width 2	1.4		
	Width 3	1		
	Average	**3.6**	1.2	m
2	**Depth of the stream**	**Depth in(m)**	**Average depth(m)**	
	Width 1			
	Depth 1	0.37		
	Depth 2	0.22		
	Depth 3	0.15		
	Total	**0.74**		
	Average depth (a)		**0.25**	m
	Width 2			
	Depth 1	0.35		
	Depth 2	0.36		
	Depth 3	0.24		
	Total	**0.95**		
	Average depth (b)		**0.32**	m
	Width 3			
	Depth 1	0.26		
	Depth 2	0.13		
	Depth 3	0.36		
	Total	**0.75**		
	Average depth ©		**0.25**	m
	Total(a+b+c)=	**0.81**	**0.27**	m
		Total Area	**0.33**	m2
	Distance 2m taken for paper flow to get velocity			
3	**Time**	**Time in second**	**Average time in sec**	
	T1	3.11		
	T2	3.62		
	T3	3.48		
	T4	2.96		
	T5	3.1		
	T6	3.9		
	T7	3.29		
	Total Time in sec	**23.46**	**3.35**	sec
		Velocity=Distance/time	0.597	m/sec
	Formula of Discharge(Q)=Area x velocity			
	Area	0.33		m2
	Velocity	0.597		m/sec
	Discharge		0.194	m3/sec

	Total Discharge of stream per litre	**194.22**	**LPS**
	E-Flow-30%(less)	**58.27**	**LPS**
	20% for municipal traping(less)	**38.84**	**LPS**
		97.112	**LPS**
	Actual Discharge of water for the new project as on 16.11.2023	**97.112**	**LPS**

Prepared By:

Kencho Dhendup
Site Engineer

Indra Bdr. Kararia
Sr. Technician

Chief District Engineer
Dzongkhag Administration
Tsirang

Annex 10. FPIC Protocols Followed During Community Consultations

Indigenous peoples' rights are recognized by international law as well as inclusive state laws of most countries. However, there are still many States where specific mention of indigenous peoples (IP) may not occur, this is also in the case of Bhutan where there is no specific law for IP. In Bhutan, the concept of 'indigenous peoples' is not used but people are differentiated as 'socio-cultural groups'. Since development needs are articulated at village level, all households are fully involved in prioritization of development needs and activities and implementation. Members of all socio-cultural groups are hence included in all phases of development and receive equal access and benefits to the outputs of development programmes. In this context, MoIT/PMU will uphold the obligations with regard to the SES by ensuring that FPIC is implemented where required in a suitable way forward to ensure compliance with the SES with a focus on aligned communications with Government counterparts and affected people.

The Project ensures that arrangements, evidenced in a documented outcome, are concluded with the project related socio-economic groups for the equitable sharing of benefits to be derived by the project in a manner that is culturally appropriate and inclusive giving full consideration to options preferred by the groups concerned. For the Project, FPIC protocol has been considered at each stage of the community consultations allowing project-affected people to approve or reject certain proposed actions that may affect them, and that the process for reaching such a decision possess characteristic elements of FPIC.

The elements of FPIC are as follows:

FREE refers to a consent given voluntarily and absence of coercion, intimidation, or manipulation. FREE refers to a process that is self-directed by the community from whom consent is being sought, unencumbered by coercion, expectations, or timelines that are externally imposed.

PRIOR means that consent is sought sufficiently in advance of any authorization or commencement of activities. Prior refers to a period of time in advance of an activity or process when consent should be sought, as well as the period between when consent is sought and when consent is given or withheld. Prior means in the early stages of a development or investment plan, not just when the need arises to obtain approval from the community.

INFORMED refers mainly to the nature of the engagement and the type of information that should be provided prior to seeking consent and as part of the ongoing consent process.

CONSENT refers to the collective decision made by rights holders and reached through the customary decision-making processes of affected people or communities. Consent must be sought and granted or withheld according to the unique formal or informal political-administrative dynamic of each community.

While the goal of consultation processes shall be to reach an agreement (consent) between the relevant parties, this does not mean that all FPIC processes will lead to the consent and approval by the rights-holders in question. At the core of FPIC is the right of the peoples concerned to choose to engage, negotiate, and decide to grant or withhold consent, as well as the acknowledgment that under certain circumstances it must be

accepted that the project will not proceed and/or that engagement must be ceased if the affected peoples decide that they do not want to commence or continue with negotiations or if they decide to withhold their consent to the project.

Since consultation is always a key component of an FPIC process, the SES define key principles for meaningful, effective and informed stakeholder consultation that apply.

In order to comply with the UNDP SES, meaningful, effective and informed stakeholder engagement was carried out during project design phase and has been reported in the Stakeholder Engagement Plan. The project designs have been modified since then taking into consideration the concerns and recommendations from these consultations.

Following the consultations, the Dzongkhag and the Local Government sought the informed consent of the communities especially the affected households whose land would be impacted during the construction phase. The consents and clearances are attached here in Annex 10.

The Stakeholder Engagement during the ESIA and ESMP preparation phase is a continuation of the FPIC consultation processes, wherein the updated project design was shared for feedback and incorporation of concerns and recommendations into the ESMP.

Prior to community consultations, advanced notification of the meeting dates was sent to the Dzongkhag administration wherein it was clearly specified that participants should include the local community that would benefit from or be impacted by the Project, including affected persons and vulnerable groups.

Each meeting was organised based on prior consultations with relevant community leaders or group representatives. During the meeting at the district, the local community representatives were again briefed on the objectives of the community consultations and requested to provide prior information to all relevant community members on the objectives of the meeting and to invite them to attend the meeting. The local representatives were requested to especially ensure that affected persons, women and vulnerable groups were given prior notification regarding the meeting and to seek the confirmation of participants that they would be attending the meeting voluntarily.

The Gup and the Tsogpas confirmed that they informed all the participants regarding the meeting via their social chat groups wherein the participants had confirmed their participation prior to the meeting.

The meeting venue was selected at the Gewog meeting hall, as this is both a neutral and familiar location and readily accessible to all. The gewog centre is also spacious enough, allowing the organizers to form smaller groups for community mapping exercises and to conduct smaller group meetings to allow focused discussions.

Each meeting began with a formal introduction by the consultants, PIU and Dzongkhag staff (Agriculture, forest officers) and a presentation on the meeting agenda and objectives. The introduction also included an explanation on how the larger group would be broken up into smaller groups for community mapping and focused discussions. There were no reservations to the agenda or to the proposal for conducting mapping and breaking up into smaller groups. Participants were free to choose whichever groups they wanted to join.

The meeting was conducted in the local language Dzongkhag as well as in the local dialect (Nepali).

The project design including location of each component, the pipeline alignment, materials to be used, mode of construction and project construction timeline was

presented by the Dzongkhag Engineer. He also specified which chiwogs would benefit from the project and that these were included in the project based on the community consultations during the project preparatory phase and the need for the project expressed during prior consultations. He informed the meeting that the selection of the locations for the reservoir tanks and pipeline alignment had been carried out in consultation with the Tsopga (community representative). Clarifications were provided to concerns on project design and impacts.

The consultant explained the ESIA process and informed the members that the purpose of the ESIA was to identify potential environmental and social impacts of the project. The project design was projected onto the screen (google earth) and community members were asked to share their views on potential environmental and social impacts of the project. The consultant also informed the community on potential environmental and social impacts including how the water pipeline would traverse private land which could impede cropping or access or could be risky during the construction period, and the negative impacts due to influx of workers such as GBV or sexual harassment, trespassing, and encroachment.

The participants confirmed that they are aware of the project as past consultations had already been conducted with them. They also confirmed that the affected persons have already given their written consent for the project after the previous consultations to the Dzongkhag.

The consultant explained the GRM process to the participants to seek their views on this and discussions were focused on the need for a female member to be included as part of the GRM committee or whether alternatives were required.

The smaller groups discussions were focused on engaging the community members in mapping the project components and identifying PCRs, settlements, school, health infrastructure, existing water sources and forest areas utilized by the communities. The seasonal calendar was also discussed wherein participants actively engaged in crops cultivated, times when they faced water shortages, human wildlife conflicts, other existing challenges and their views on the project.

During the meeting participants people spoke freely. In the meeting in Punakha, the participants voiced their concerns regarding the project design based on which the design was later modified. The meeting allowed participants and their representatives to speak on behalf of affected persons. For instance, the Patshaling Gup raised the concern about the outlet provision that was confirmed in prior consultations but not incorporated into the presented design. This was addressed validating the confirmation for the outlet at Patshaling. The design was modified taking into consideration the concerns during the community consultation. The design change has been recommunicated to the Local Government through the PIU.

Furthermore, participants who were not direct beneficiaries also expressed concerns about the risk of damage to water pipelines on their property. This concern has been noted in the ESIA and measures incorporated in the ESMP.

FIPC Protocol followed:

Key steps in project implementation	Process	Steps undertaken

Project Planning and Meetings and Stakeholder consultations	1. Engage all Chiwog Tshogpas and validate the inclusion of all chiwogs and their concerns 2. Validate and document geographic and demographic information through participatory mapping 3. Design a participatory communication plan and carry out iterative discussions through which project information will be disclosed in a transparent way - in a convenient location and at a convenient time for all chiwogs and in a language best understood by all Chiwog Tshogpas 4. Reach consent, document all Chiwogs needs that are to be included into the project, and agree on a feedback and complaints mechanism in line with GRM process described in the ESMF document	1. All relevant Chiwog Tsogpas were invited to attend the Dzongkhag consultations and to invite participants from their chiwogs for the commnunity consultation. 2. Participatory community mapping exercise was carried out for each Gewog. 3. Informatio on the consultation was disseminated through the Chiwog social chat group, with specific details on the consultation such as meeting date, time, venue and requiring community members to confirm their voluntary participation or representation. 4. The GRM process was presented and views sought on th GRM committee members, process and procedures including the timeline. All concerns raised by the participants were documented, presented and discussed with the PIU and PMU following the field visit, resulting in further alteration to the project design and beneficiaries.
At Project Implementation	5. Engage the concerned Chiwog Tsgogpas when conducting project monitoring and evaluation of the project activities and during review of annual implementation (participatory monitoring and evaluation)	Concerned Chiwog Tsogpas were invited to both the Dzongkhag and Community consultations by the Local Government. During project compliance monitoring, the Tsogpas will play a key role in project monitoring of the construction activities.
Project Closure	6. Document lessons learned and disclose information about project achievements to all project chiwogs	

Following are the Clearances received as part of the FPIC protocol: