Initial Environmental Examination Report (IEE)

Druk Bindu – Kangduphu (Jogimara) 66kV Transmission Line Project (2024)

Proponent: Bhutan Power Corporation Limited

June 2024

Prepared by:

Center for Environment and Development (CED)

This IEE contains suggestions and revisions made by the JICA survey team, Tokyo Electric Power Services Co., Ltd. (TEPSCO) and OPMAC Corporation, for "Preparatory survey for hydropower development project in Bhutan".

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ABBREVIATIONS / ACRONYMS

ACSR	Aluminum Conductor Steel Reinforced
AH/AP	Affected Household/Affected People
AP	Angle Point
BAP	Biodiversity Action Plan
BC	Biological Corridor
BHU	Basic Health Unit
BIS	Bureau of Indian Standards
BPC	Bhutan Power Corporation Limited
BS	Bhutan Standards
BSB	Bhutan Standards Bureau
CA	Competent Authority
CD	Construction Division
CEO	Chief Executive Officer
CMS	Contract Management Section
CPO	Construction Project Office
CS	Construction Section
CSP	Corporate Strategic Plan
D/C	Double Circuit
DECC	Department of Environment & Climate Change
DEM	Digital Elevation Model
DGPC	Druk Green Power Corporation
DHyE	Druk Hydro Energy Limited
DO	Dissolved Oxygen
DoE	Department of Energy
DoFPS	Department of Forest and Park Services
DoHPS	Department of Hydro Power & Power Systems
DPR	Detailed Project Report
DSMP	Distribution System Master Plan
DTM	Digital Terrain Model
EA	Environmental Assessment
EC	Environmental Clearance
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
EM&MP	Environmental Management & Monitoring Plan
ERA	Electricity Regulatory Authority
ESIA	Environment & Social Impact Assessment
FAO	Food and Agriculture Organization of the United Nations
FNCA	Forest and Nature Conservation Act
FSR	Feasibility Study Report

GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Geographical Positioning System
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HH	Household
HPP	Hydropower plant
ICNRP	International Commission on Non-Ionizing Radiation Protection
IEE	Initial Environment Examination
IS	Indian Standards
IUCN	International Union for Conservation of Nature
JAXA	Japan Aerospace Exploration Agency
JICA	Japan International Cooperation Agency
LULC	Land Use Land Cover
masl	meter above sea level
MoAF	Ministry of Agriculture & Forest
MoENR	Ministry of Energy and Natural Resources
NCHM	National Center for Hydrology & Metrology
NECS	National Environment Commission Secretariat
NEPA	National Environment Protection Act
NES	National Environment Strategy
NLC	National Land Commission
NOC	No Objection Certificate
NTGMP	National Transmission Grid Master Plan
NTT	Nippon Telegraph and Telephone Public Corporation
O&M	Operation & Maintenance
OHS	Occupational, Health and Safety
OPGW	Optical Ground Wire
ORC	Out Reach Clinics
PAP	Project Affected People
PAVA	Property Assessment and Valuation Agency
PCC	Plain Cement Concrete
PM	Particulate Matter
PPE	Personal Protective Equipment
PSMP	Power Sector Master Plan
PTL	Power Transmission Line
RCC	Reinforced Cement Concrete
RDS	Respirable Dust Sampler
RESTEC	Remote Sensing Technology Center of Japan
RGoB	Royal Government of Bhutan
RoW	Right-of-Way

RPM	Respirable Particulate Matter
RSPM	Respirable Suspended Particulate Matter
S/C	Single Circuit
SNC	Second National Communication
SRFL	State Reserved Forest Land
SS	Substation
STDs	Sexually Transmitted Diseases
TDS	Total Dissolved Solids
TEPSCO	Tokyo Electric Power Services Co., Ltd
TL	Transmission Line
TOMS	Transmission Operation & Maintenance Section
TOMU	Transmission Operation & Maintenance Unit
ToR	Terms of Reference
TraMCA	Transboundary Manas Conservation Area
TSPM	Total Suspended Particulate Matter
TSS	Total Suspended Solids
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCD	Wildlife Conservation Division
WHO	World Health Organization
WUA	Water Users' Association
WWF	World Wildlife Fund

WEIGHTS AND MEASURES

°C	degree Celsius	kVA	Kilo-volt-amperes
µg	micro gram	kWh	kilowatt hour
cm	centimeter	m	meter
dB	Decibel	masl	meter above sea level
GW	Giga-Watt	mG	milliGauss
GWh	Giga-Watt hour	mm	millimeter
kg	Kilogram	MVA	megavolt-amperes
km	kilometer	MW	megawatt
kV	kilovolt (1,000 volts)	µT	microteslas

EXECUTIVE SUMMARY

The Kingdom of Bhutan is one of the few net-carbon sink economies that is committed to remaining carbon neutral. Apart from the large proportion of forest cover that serves as a carbon sink, the pursuit of run-of-river hydropower projects have enabled the country to meet its growing domestic energy needs as well as to earn Indian Rupees (INR) from export of electricity. Of the estimated 30GW hydropower potential, the country has harnessed only about 1.6 GW of hydropower with support from India and other countries. Although the domestic annual electricity demand of only 2,459 GWh in 2021 allowed for 77% of its annual energy generation to be exported to India, the country is faced with increasing domestic demand for hydroelectricity. In 2021, earnings from export of electricity to India accounted for 40% of country's total annual export. This share of hydroelectricity in country's export earnings is expected to decrease as more of its energy generation is consumed by its energy intensive industries and businesses. This is further aggravated by the lean winter season during which hydropower generation decreases sharply to 20-40% of its peak monsoon season generation. As the country graduates from its LDC status to developing country category, its need for economic development will further translate to increasing domestic demand for electricity. It is for this reason that the country has embarked on a number of policies and plans to bridge the energy gaps while living up to its commitments for a carbon neutral economy. In the wake of the economic downturn with the Covid-19 pandemic, it has become even more urgent to harness the hydropower potential to help stimulate economic activities at the grass root levels and to generate employment.

The Royal Government of Bhutan (RGOB) has opted to pursue a low carbon development pathway. Towards this objective, a number of policies, strategies, and action plans have been developed. The National Strategy and Action Plan for Low Carbon Development, 2012 recommends several potential interventions and mitigation actions including hydropower development. The Economic Development Policy, 2016 recognizes the energy sector as the main driver of the country's economy and calls for accelerated development hydropower and alternative renewable energy sectors to improve domestic energy supply. Climate Change Policy of the Kingdom of Bhutan, 2020 states that Bhutan will pursue transformative actions and approaches to decouple GHG emissions from industrial sectors through improved efficiency and diversification of energy sources. The Bhutan Sustainable Hydropower Development Policy 2021 reinforces the strategic importance of hydropower in providing sustainable energy access and ensuring energy security. The National Comprehensive Development Plan 2030, the Power Sector Master Plan 2040 (PSMP 2040), all prioritize development of large as well as small hydropower projects. The concept note for the 13th Five-Year Plan (2023-2028) identifies the need for consistent and adequate electricity from source within the country. In order to meet the growing domestic demand for energy, the government is prioritizing development of small hydropower projects.

Among many other small hydropower projects currently under different stages of development, the Department of Energy (DoE), Ministry of Energy and Natural Resources (MoENR) has prioritized development of small and medium hydropower projects. Druk Bindu hydropower project is among the six projects that have been approved by Department of Energy as techno-economically viable and

considered for feasibility study and upgradation of existing FSR and DPR. The Druk Green Power Corporation (DGPC), as the agency responsible for hydropower generation is expediting the development of 26MW Druk Bindu (18MW and 8MW) Hydropower project. Bhutan Power Corporation (BPC) as the implementing agency for transmission and distribution of electricity in the country, is working closely with DGPC to plan and implement the transmission lines for evacuation of power from the above two projects.

The Royal Government of Bhutan (RGOB) has formally asked the Japanese government for financial support to develop hydropower Projects in Bhutan. This time the hydropower projects under consideration include the Druk Bindu hydropower plants (comprising 2 units with capacities of 18MW and 8MW). Additionally, the plan involves constructing transmission lines to support these projects. These initiatives are part of the Bhutan government's efforts to promote relatively smaller hydropower developments, which are deemed crucial given the current supply and demand dynamics and project economics. Implementing these projects is anticipated to enhance power stability in Bhutan during dry seasons and meet the escalating power requirements, thereby fostering the expansion of a reliable and sustainable power infrastructure in the country. These initiatives are recognized as pivotal within the power sector. In evaluating the project for potential support, the Japan International Cooperation Agency (JICA) has initiated a preparatory study encompassing both the development of the Druk Bindu hydropower facilities as well as the construction of transmission lines to Kangduphu (Jogimara) substation in Tashicholing Gewog, Samtse.

The JICA team has meticulously calculated the total cost estimates for both the hydropower plants and their associated transmission lines. The estimated cost for constructing the 14km 66kV S/C Druk Bindu transmission line is **Nu. 199.7 million** or **359.5 million Japanese Yen**, which also encompasses the Environmental Management Plan (EMP) expenses. A comprehensive assessment of the environmental and social impacts was conducted, focusing on their direction, magnitude, extent, duration, and frequency to the best possible extent. Following this assessment, mitigation measures were formulated as integral components of the EMP. The projected cost for implementing the EMP, covering expenses such as land substitute/compensation, crop damages compensation, and leasing, is approximately **Nu. 2.335 million** for the 66kV Druk Bindu Transmission line project.

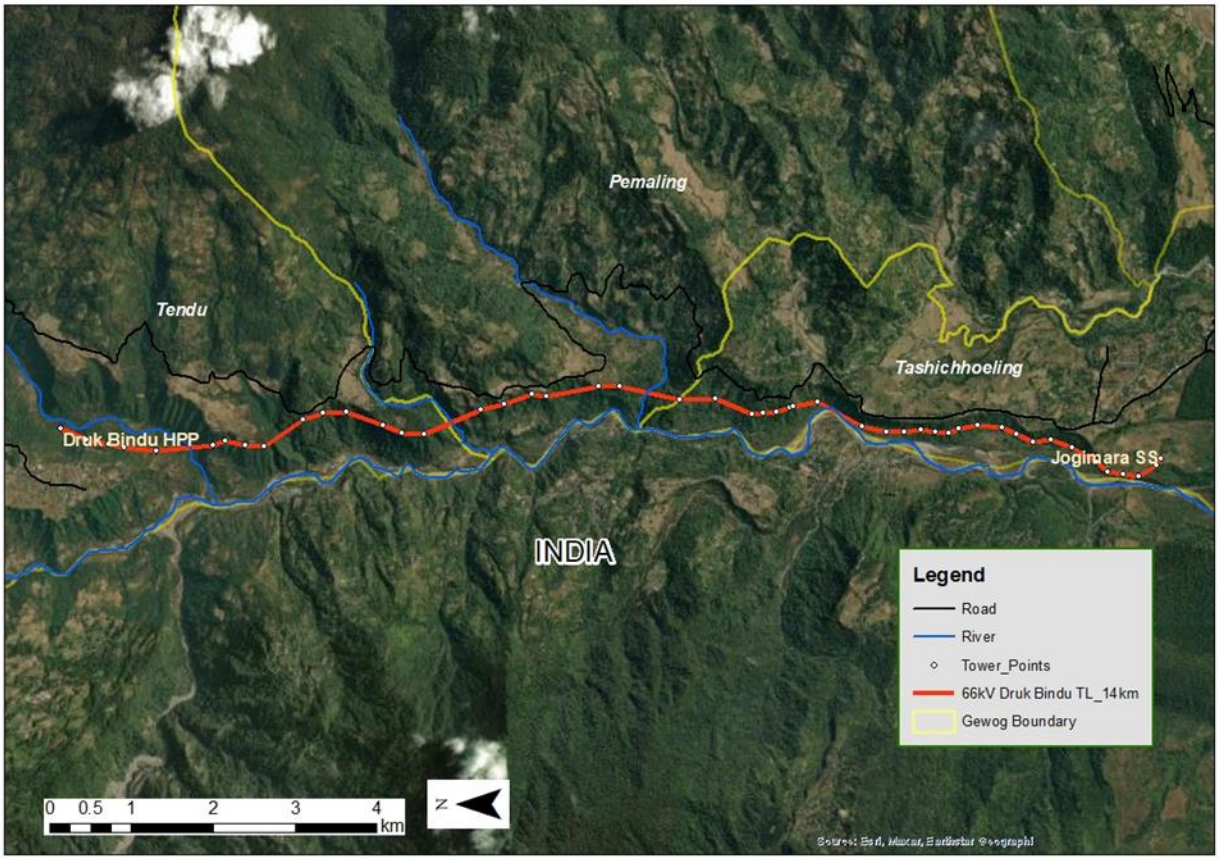
1. INTRODUCTION

1.1. Project Background and objectives

The Royal Government of Bhutan (RGOB) has opted to pursue a low carbon development pathway. Towards this objective, a number of policies, strategies, and action plans have been developed. The National Strategy and Action Plan for Low Carbon Development, 2012 recommends several potential interventions and mitigation actions including hydropower development. The Economic Development Policy, 2016 recognizes the energy sector as the main driver of the country's economy and calls for accelerated development hydropower and alternative renewable energy sectors to improve domestic energy supply. Climate Change Policy of the Kingdom of Bhutan, 2020 states that Bhutan will pursue transformative actions and approaches to decouple GHG emissions from industrial sectors through improved efficiency and diversification of energy sources. The Bhutan Sustainable Hydropower Development Policy 2021 reinforces the strategic importance of hydropower in providing sustainable energy access and ensuring energy security. The National Comprehensive Development Plan 2030, the Power Sector Master Plan 2040 (PSMP 2040), all prioritize development of large as well as small hydropower projects. The concept note for the 13th Five-Year Plan (2023-2028) identifies the need for consistent and adequate electricity from source within the country. In order to meet the growing domestic demand for energy, the government is prioritizing development of small hydropower projects.

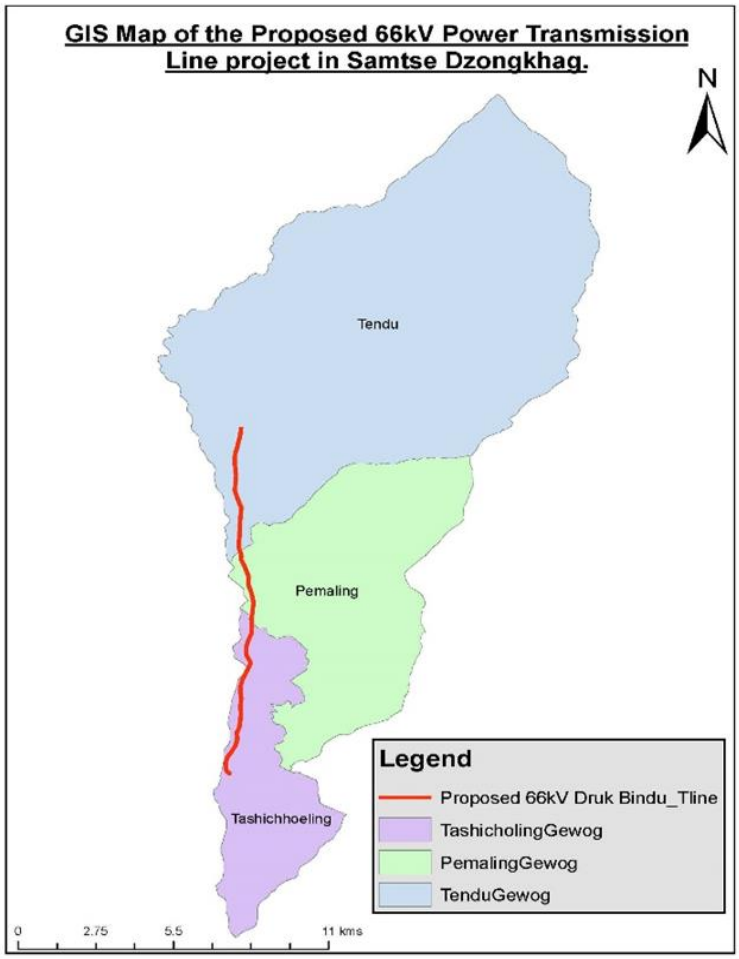
Among many other small hydropower projects currently under different stages of development, the Department of Energy (DoE), Ministry of Energy and Natural Resources (MoENR) has prioritized development of small and medium hydropower projects. Druk Bindu hydropower projects are among the six projects that have been approved by Department of Energy as techno-economically viable and considered for feasibility study and up-gradation of existing FSR and DPR. The Druk Green Power Corporation (DGPC), as the agency responsible for hydropower generation is expediting the development of the 26MW Druk Bindu (18MW and 8MW) Hydropower project. Bhutan Power Corporation (BPC) as the implementing agency for transmission and distribution of electricity in the country, is working closely with DGPC to plan and implement the transmission lines for evacuation of power from the above project.

BPC is proposing to develop a 66KV transmission line to evacuate hydroelectricity from upcoming 26MW Druk Bindu small HPP to Kangduphu (Jogimara) substation in Tashicholing Gewog, Samtse. After exploring a number of alteratives based on the assessment of social, economci and environmental impacts, the proposed route follows the corridor between the Druk Bindu river and the Tendu-Tashicholing highway (Map 1-1).



Map 1-1: The proposed 66kV Druk Bindu TL Route alignment

The proposed transmission line project comprises of about 14km long 66kv S/C transmission line that is proposed to pass through three Gewogs i.e., Tendu, Pemaling, and Tashicholing under Tashicholing Dungkhag, Samtse Dzongkhag (Map 1-2). Starting at an evevation of about 750 masl where the 18MW Druk Bindu I powerhouse is located, the transmission line comprising of 48 towers will be located at various elevations ranging from 350 masl to as high as 900 masl. The length and distribution of the transmission towers across Gewogs and land ownership are provided in Table 1-1 below.



Map 1-2: GIS map showing location of TL

Table 1-1: 66kV Druk Bindu Transmission line route details

SN.	Dzongkhag	Gewogs	Transmission line Length (km)	Total No. of towers
1	Samtse	Tendu	4.7	15 Towers
2		Pemaling	3.2	7 Towers
3		Tashichholing	6.2	26 Towers
		TOTAL	**14.1 km**	**48 Towers**

1.2. IEE Objectives and Scope

The RGoB has requested the Japanese government for financial assistance to develop the above two projects. In appraising the projects for consideration by the Japanese Government, Japan International Cooperation Agency (JICA) has commissioned a preparatory study of the two projects covering development of both the Druk Bindu hydropower and associated transmission lines.

At the time of carrying out this assignment, DGPC has already prepared the Environmental and Social Impacts Assessment (ESIA) Report of Druk Bindu I and Druk Bindu II Hydropower Projects. BPC was at the point of initiating Initial Environment Examination (IEE) for Druk Bindu transmission line. For this, BPC has secured wet season biodiversity information for Druk Bindu.

In accordance with the Initial Environmental Examination (IEE) guideline and form for the transmission and distribution project 2017 for the assignment, this report was prepared for the proposed 14km 66kV Druk Bindu Power transmission line from the proposed Druk Bindu Hydropower plant to the Kangduphu Substation.

With assistance from Department of Forest and Park Services (DoFPS), BPC had obtained wet season biodiversity information for Druk Bindu. Considering that the TOR for IEE (Appendix-1) requires environmental and biodiversity baseline information for two seasons i.e., wet and dry season, a separate survey was fielded to obtain dry season social and environmental information of the project sites, which will feed into preparation of the IEE for Druk Bindu transmission line projects.

The final reports are to be compiled in order to meet the requirement of JICA by providing additional information or, if necessary, correcting/improving information on natural environmental data such as rare, endangered and protected species and Social Environmental Data & Information such as examining social impacts and preparing the abbreviated resettlement plan for project affected people (PAP) in project sites. Based on the result of natural environment and social surveys, potential natural and social environment impacts of the project are assessed and preliminary environment management plans including recommendations for mitigation measures to address negative impacts are proposed.

1.3. IEE Methodology

1.3.1. Scoping

The scoping summary of the 66kV Druk Bindu transmission line encompasses the assessment of various impact items pertaining to both the pre-construction and operational phases.

In terms of pollution control, during the construction phase, temporary air quality issues are anticipated due to dust generated from civil engineering works, though emissions from heavy equipment and trucks are expected to be limited to the construction area. However, no air pollution

is expected during the operation phase. Water quality is likely to be affected during both phases due to soil runoff from exposed areas, potentially worsening stream water quality.

Waste generation is foreseen during construction, but not during operation. Soil quality may suffer during construction due to possible contamination from construction activities, though no such issues are expected during operation. Noise and vibration are expected during construction due to machinery and construction activities, but not during operation. No significant impact on subsidence, odor, or sedimentation is anticipated in either phase.

The project will not traverse any protected areas, thus eliminating any impact on such regions. However, construction activities might affect the terrestrial ecosystem, particularly in areas where vegetation needs to be removed for construction of tower and RoW, which could influence migratory behavior during the operational phase. Nevertheless, significant impacts on hydrology, topography, and geology are not anticipated.

In terms of social aspects, resettlement is not foreseen in the transmission line project. However, land acquisition may take place during the pre-construction phase, with no such activity expected during operation. Vulnerable groups and ethnic minorities may be affected during both phases, necessitating verification and consideration. Employment opportunities are expected during construction and operation, potentially affecting local economies. Land and resource use may be impacted, particularly if residents engage in activities near the project site. Social infrastructure may experience temporary disruptions during construction but may benefit during operation.

Safety concerns include the possibility of accidents during construction, including traffic accidents due to increased traffic volume. In the operation phase, specific impacts on sanitation, safety, and security are not predicted. Additionally, no transboundary impacts or significant climate change effects are anticipated, as the transmission lines do not cross borders and no CO_2 is generated.

Overall, the evaluation indicates various potential impacts and highlights areas requiring further examination and evaluation as the project progresses.

1.3.2. Environmental Assessment

Considering that the proposed Druk Bindu transmission line and the Druk Bindu Hydropower projects are located the same area, the ambient water and air quality monitoring were carried out to cover both projects.

1.3.2.1. Ambient Water Quality

Considering that the transmission line project activities neither require water as an input nor involve water and water bodies, the ambient water quality measurements were taken to obtain the baseline water quality. Ambient water quality tests were carried out across four sampling sites (Table 1-2).

Table 1-2: Ambient water quality monitoring stations

		Coordinates		
Plot ID	**Locality**	**Northing**	**Easting**	**Elev (m asl)**
DB AW 01	Power house I	27.1223786	88.8798539	702
DB AW 02	Dumpyard I	27.1161173	88.8792336	654
DB AW 03	Power house II	27.1084172	88.8767861	590
DB AW 04	Jamtsholing	26.9510712	88.8775872	198

The physiochemical parameters measured include pH levels, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Ammonia (NH_3), Turbidity, Chloride, and Total Hardness (TH), salinity, Ammonium (NH_4), Nitrate (NO_3), Chlorine, Calcium Hardness (Ca), Magnesium Hardness (Mg), and Total Suspended Solids (TSS).

1.3.2.2. Ambient Air Quality and Noise Levels

The air quality monitor AQM-09 Oceanus make & AQM-370, Envirotech make, were used in monitoring noise and air quality of the project area. These equipment are real time sophisticated sampling devices, capable of detecting both particulates & gaseous pollutants along with auxiliary parameters such as ambient temperature, relative humidity, atmospheric pressure, Wind Direction, Wind Speed and heat Index. The AQM-09 is integrated with noise meter that can measure the sound in decibel simultaneously with the air quality parameters. Since the AQM-370 has no sound & wind speed detectors incorporated in the device, separate sound level meter SLM-100 was used to capture the sound along with the device. Both devices measure air quality based on the principle of light scattering for concentration of particulates and electrochemical sensors for gaseous pollutants. The device is equipped with light scattering diodes that are capable of detecting particulate matters of $PM_{2.5}$, PM_{10} & TSP and pre-calibrated sensors for gaseous pollutants such as Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2) and Carbon Monoxide (CO). For noise level mentoring, we have used the sound level meter that has capable of measuring noise at different ranges.

The samples were collected from three different sampling sites located at Tendu, Biru, and Tashicholing. The location coordinates of the sampling stations are given in Table 1-3. Noise levels and air quality at each site were measured over two days resulting in total six samples each with 24 hours of sampling duration.

Table 1-3: Noise and Air Quality Monitoring Station Name and Coordinates

Station Name	Latitude	Longitude
Tendu	27°6'53.70552"	88°52'27.36228"
Biru (Pemaling)	27°3'47.38176"	88°53'7.06488"
Sipsu (Tashicholing)	27°2'24.27144"	88°53'7.36224"

1.3.2.3. Vegetation

To optimize findings from the survey, a purposive sampling method was employed within the proposed project. This sampling approach considered factors such as accessibility, geographical suitability, and operational efficiency. The identified sites encompassed crucial elements including access roads, intake structures, powerhouse, dump yard, and designated camp sites.

The Biodiversity Monitoring and Social Survey Protocol of Bhutan recommends a 20 × 20 m, 5 × 5 m, and 2 × 2 m quadrant for national level tree, shrub and herb diversity assessment, respectively (DoFPS, 2020). However, for general purpose vegetation analysis, a quadrant or transect of 200 m^2 also proves appropriate (Gillison, 2006). To enhance sampling efficiency within the relatively small area and to make easy laying of plots along rugged topography of the project site, this study adopted 15 × 15 m quadrat plots for trees, 4 ×4 m for shrubs and 1 × 1 m for herbs (Figure 1-1). The shrub and herb plots were placed at the lower right-hand corner of the 15 × 15 m plot. Using the standard protocol (DoFPS, 2020), heights, counts and diameter at breast height (DBH) (≥ 10 cm at 1.3 m DBH) of tree species, counts of shrub and herb species, were recorded for each plot.

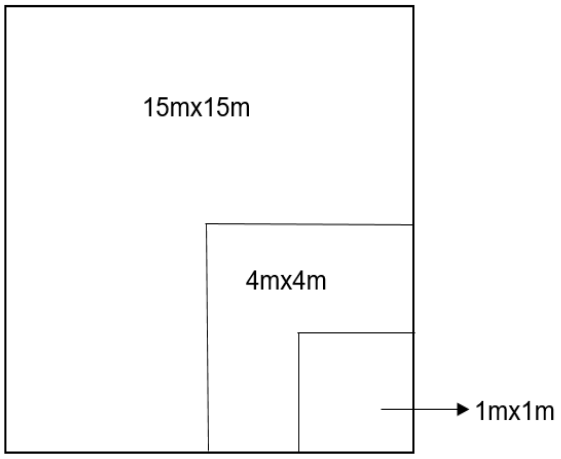


Figure 1-1: Dimensions of plots employed in vegetation survey

A total of 15 plots were laid across the length of the transmission line. The plots surveyed were identified with serially numbered codes. For example, DBTL01 is the identity of the plot no. 1 of Druk Bindu Transmission Line area. The details of the plot IDs and location coordinates is given in Table 1-4 below:

Table 1-4: Druk Bindu TL – Vegetation Plots Coordinates (Decimal Degrees)

Plot ID	Latitude	Longitude
DBTL01	27.117818	88.878125
DBTL02	27.1118889	88.8768333
DBTL03	27.1042778	88.8774444
DBTL04	27.1005278	88.8769444
DBTL05	27.0959722	88.8784167
DBTL06	27.0849444	88.8783889
DBTL07	27.07775	88.8791667
DBTL08	27.0704444	88.8813056

Plot ID	Latitude	Longitude
DBTL09	27.0610278	88.8833889
DBTL10	27.054034	88.882332
DBTL11	27.0471667	88.8808056
DBTL12	27.0404722	88.8822222
DBTL13	27.0250278	88.8786111
DBTL14	27.017766	88.878123
DBTL15	27.0056111	88.8740556

Map 1-3: Map showing distribution of the vegetation plots in the project area

1.3.2.4. Vegetation data analysis

a) Diversity

The plot-wise and overall floristic diversity was computed using the Shannon-Wiener index, employing the following formula:

$$H' = -\sum_{i=1}^{n} pi * lnpi$$

Where *H'*= Shannon diversity
p_i= The proportion of individuals belonging to the ith species
ln= Natural logarithm function Tree

b) Tree density

Tree density was computed by dividing the total number of trees counted within the plot by the plot area in hectares, employing the following formula:

$$Tree\ density\ per\ Ha = \frac{Number\ of\ trees\ in\ each\ plot}{Area\ in\ Ha}$$

c) Tree volume

The true volume formula was used for the estimation of tree volume

$$True\ volume = \pi \times r^2 \times Height\ of\ the\ tree$$

1.3.2.5. Wildlife

a) Mammals

Camera traps were installed in forested areas based on expert recommendations and local ecological knowledge to capture the real time occurrence of mammals. Additionally, various wildlife signs such as pugmarks, hoofmarks, dropping, scats, hairs, and burrows were recorded to supplement the camera trap data.

Druk Bindu project mainly falls in the vegetation zone defined by subtropical forest in the southern part and warm broadleaved forests near proposed project. A total of two camera traps were installed across the proposed hydropower and transmission line project. Camera traps were placed based on the recommendations of forestry officials and local inhabitants, to identify high-traffic wildlife movement areas.

b) Avifauna

Broad survey was employed to record bird species associated with forest and stream ecosystems. The avifaunal survey was conducted using amalgamated transect and point count methods. The transects were essentially along the routes followed by surveyors to get from one forest plot to another. Along these transects, observation were made from sampling points, spaced at approximately 100m intervals. Bird species were identified using binoculars, cameras with macro lenses, and based on their distinctive calls and vocalizations. All individuals observed and/or heard were recorded with species name, numbers of individuals, habitat type, elevation, geographic coordinate, and other information needed. The protection status of the species was determined based on IUCN Red List data and Bhutan's Forest and Nature Conservation Act (FNCA 2023).

c) Herpetofauna

The herpetofauna survey, focusing on reptiles and amphibians, was primarily conducted as a supplementary task during navigation to forest plots and within immediate vicinity of these plots. Opportunistic broad survey was adopted to collect and record reptiles in the sampling areas. Both transect and visual encounter methods were employed. Techniques such as 'rock rolling', 'vocalization' and 'habitat searching' were also employed. These involves careful lifting and rolling of rock to expose hidden amphibians and reptiles, listening to their call/ croaks, and exploring habitats favored by herpetofauna, especially wetlands, streams, and ponds.

1.3.3. Socio-economic Assessment

The methodologies employed in gathering the baseline information on for gathering demographic information and socio-economic status involved:

1. Gathering of secondary information through available reports and websites
2. Meetings, Discussions and Interview of Government Officials, Local Government Elected Representatives and community forest groups using open ended structured interview questions.
3. Public and Stakeholders consultation meetings at the Gewogs and at the National Level.
4. Survey of Project Affected Population in the affected areas.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This part of the ESIA reviews the policies, acts, regulations, guidelines and standards that are relevant to the proposed construction of 14km 66kV S/C PTL from the proposed 26MW Druk Bindu Powerhouse to the existing 66/33kV Jogimara substation. The reviews are intended to ensure that policies and regulations have been reviewed and to comply with the necessary regulations during the execution of the project.

The various policies and regulations ensure the protection of its pristine environmental heritage while pursuing economic development. Bhutan has strong policies and regulations to conserve its environment and maintain a balance between environment and development. The details of the review of policy and legal frameworks relevant to the proposed project are provided below:

2.1. The Constitution of Bhutan

The constitution of the Kingdom of Bhutan declares itself as the "Supreme Law" of the state and was promulgated on 18th of July, 2008. Article 4 on Culture states that the state shall endeavor to preserve, protect and promote the cultural heritage of the country, including monuments, places and objects of artistic or historic interest, Dzongs, Lhakhangs, Goendeys, Ten-sum, Nyes, language, literature, music, visual arts and religion to enrich society and the cultural life of the citizens. Article 5 of the constitution is also applicable to the proposed project which states that every Bhutanese is a trustee of the Kingdom's natural resources and environment for the benefit of the present and future generations and it is the fundamental duty of every citizen to contribute to the protection of the natural environment, conservation of the rich biodiversity and prevention of all forms of ecological degradation including noise, visual and physical pollution through the adoption of environment friendly practices and policies. The Royal Government shall:

- Protect, conserve and improve the pristine environment and safeguard the biodiversity of the country.
- Prevent pollution and environmental degradation.
- Secure ecologically balanced sustainable development while promoting justifiable economic and social development, and
- Ensure a safe and healthy environment. The Government shall ensure that, in order to conserve the country's natural resources and to prevent degradation of the fragile mountain ecosystem, a minimum of 60% of Bhutan's total land shall be maintained under forest cover for all time.
- Parliament may, in order to ensure sustainable use of natural resources, enact environmental legislation and implement environmental standards and instruments based on the precautionary principle, polluter pay principle, maintenance of intergenerational equity, and reaffirm the sovereign rights of the State over its own biological resources.

- Parliament may, by law, declare any part of the country to be a National Park, Wildlife Reserve, nature reserve, protected forest, biosphere reserve, critical watershed and such other categories meriting protection.

2.2. National Environment Protection Act 2007

The Act is guided by environmental principles, which states that:

- A developmental activity shall be strategically planned and executed in harmony with the carrying capacity of the country's sensitive ecological settings and geographical terrains.
- Every activity shall be planned and implemented in a way which will cause the least possible change in the environment; present the least environmental risk; minimize the consumption of space, raw materials, and energy during construction, production, distribution and utilization to the greatest extent possible including consideration of the principles of reduce, reuse and recycle; and forestall or limit environmental impact from the start.
- A person polluting the environment or causing ecological harm is responsible for the costs of containment, avoidance, abatement, medical compensation, mitigation, remediation and restoration.
- A person using natural resources shall be liable to pay for ecosystem/environmental services.
- No person shall handle or cause to be handled any hazardous substance except in accordance with such procedure and after complying with such safeguards as may be prescribed under national and international instruments.
- No person shall discharge or emit or be permitted to discharge or emit any pollutants in excess of such standards as may be prescribed.

2.3. Environmental Assessment Act 2000

The EA Act intends to establish procedures for the assessment of potential effects of strategic plans, policies, programs and projects on the environment and it applies to strategic plans, policies, programs and projects which may have an impact on the environment. Applicable provisions include:

- The issuance of an EC shall be prerequisite to the issuance of a development consent.
- Any person who seeks to carry out a project that requires a development consent shall include in the application to the CA a description of the potential environmental effects of the project for EC.
- The applicant shall ensure that concerned people and organizations are informed and consulted before submission of the EA documents to the CA.
- DECC shall review the EC and may revise and renew at least every five years, unless a shorter period is stated in the EC.

- The applicant shall provide any information in their possession or obtainable by them, which the Secretariat or the competent authority, determines is needed to carry out their duties under the Act.
- The Act also mandates that if any development activity requires a full environmental assessment study, the assessment should be done in compliance with the ToR endorsed from the Secretariat.
- The applicant shall ensure that concerned people and relevant stakeholders are informed and consulted before submission of the environmental assessment documents to the competent authority or the Secretariat.
- The Secretariat may issue the clearance upon the fulfillment of the following conditions:
    i. The effects of the project on the environment are foreseeable and acceptable;
    ii. The applicant is capable of carrying out the terms and conditions of the EC;
    iii. The project, alone or in connection with other programs or activities, contribute to the sustainable development of Bhutan and the conservation of its natural and cultural heritage;
    iv. Adequate attention has been paid to the interests of concerned people; and
    v. The project is consistent with the environmental commitments of Bhutan.

BPC has therefore, ensured that the conditions are met and the ESIA is strictly in compliance with the approved TOR.

2.4. Regulations for Environmental Clearance for Projects 2016

This regulation defines responsibilities and procedures for the implementation of the EA Act 2000 concerning environmental assessment process and the issuance and enforcement of EC for projects including;

i. To provide meaningful opportunities for public review of potential environmental impacts of projects;
ii. To ensure that all projects are implemented in line with the sustainable development policy of the RGoB;
iii. To ensure that all foreseeable impacts on the environment, including cumulative effects are fully considered prior to any irrevocable commitments of resources or funds;
iv. To ensure that all feasible alternatives are fully considered;
v. To ensure that all feasible means to avoid or mitigate damage to the environment are implemented;
vi. To encourage the use of renewable resources, clean technologies and methods; and
vii. To provide information on environmental clearance towards uniform, comprehensive data base on the environmental and cultural conditions and assets in Bhutan.

The EC application procedure is described in this regulation and specific guidance is given in Environmental Assessment Guideline for Power Transmission Line Projects and IEE form issued by the Commission. For any developmental activity, the applicant is required to submit an EC application,

containing information of the applicant, the project, funding agency, the affected environment, potential impacts, mitigation, monitoring and public consultation and when the project is subjected to ESIA/EIA, the applicant shall;

- Develop a ToR for ESIA as per guidelines issued by DECC, for approval by DECC and prepare one application inclusive of all sub-activities for EC.
- Inform and consult the concerned people and organizations prior to submission of EC application. Public consultation records, authenticated by concerned local authorities should be attached with EC application. Chapter VI of the regulation details public consultation requirements.
- All significant projects shall establish an environmental unit responsible to ensure compliance with the EC terms and conditions.
- The EC holder shall be responsible for chance find property during project implementation and report immediately to DECC or the CA of such finding.
- Non-compliance with environmental terms and conditions specified in the EC and any other provision of the Act, regulations or rules under it makes the offender liable to penalties that may include compensation for environmental damages, fines, sanctions, and suspension or revocation of EC in part or full.

2.5. Environmental Assessment Guideline for Power Transmission Line Projects (2012)

The first environmental assessment guideline was published in 1999 by the NECS for six sectors namely, mining, industries, hydropower, roads, forestry and power transmission lines. It was later revised in 2003 to make it more relevant to our Bhutanese context and in line with the EA Act 2000 and its regulation 2002. However, in 2012 it was proposed for revision and was revised and updated with financial assistance from Asian Development Bank (ADB). The guideline is mainly intended to:

i. Provide guidance and assistance to various stakeholders involved in the EA process;
ii. Assist the regulatory agency and EIA practitioners to understand the main areas of concern and use that understanding to enhance the quality of the EIA study and report;
iii. Inform the regulatory agency and EIA practitioners about the best environmental management practices in the transmission line sector;
iv. Assist the regulatory agency to better access the EIA report and arrive at a sound decision.

Therefore, BPC has carried out this ESIA in accordance with the ToR and guidelines from DECC.

2.6. National Transmission Grid Master Plan (NTGMP) of Bhutan 2018

The NTGMP of Bhutan 2018 developed by Department of Hydropower and Power System, Ministry of Economic Affairs, RGoB is the updated version of the NTGMP 2012 that was developed by Central Electricity Authority (CEA), India. The NTGMP 2018 was developed in close consultation with all relevant stakeholders of Bhutan. The study looks into the national transmission grid master plan by 2025 and also describes exhaustively about the grid scenario up to the year 2030. Bhutan has

total installed generating capacity of 1,606MW (excluding embedded generations, solar and wind) comprising of Tala (1,020MW), Chukha (336MW), Kurichhu (60MW), Basochhu-U/S (24MW) & L/S (40MW) and Dagachhu (126MW) HPs. The updated NTGMP considered the realistic hydropower development timeframe as 2020, 2025, 2030, 2035, 2040 and beyond 2040. By 2025, all the under-construction hydropower projects are expected to get commissioned. The timeframe in beyond 2040 is indicative of how the transmission systems would appear if all the techno-economically viable projects (greater than 10 MW) with total capacity of 23,833 MW are developed.

The proposed construction of one number of 66kV S/C PTL is in line with the NTGMP of Bhutan to evacuate the power generated from proposed Druk Bindu HPPs.

2.7. Bhutan Sustainable Hydropower Development Policy 2021

Clause 16 of this policy indicates that transmission and associated systems for hydropower projects must align with the National Transmission Grid Master Plan (NTGMP). The RGoB will provide necessary support to BPC to facilitate power transmission with importing countries' entities.

Clause 17, concerning social considerations, stipulates that project components should be situated in state reserve forest land whenever possible. If this is not feasible, private land will be acquired, and affected parties will be duly compensated in accordance with relevant laws.

In Clause 18, addressing environmental considerations, the policy outlines that the RGoB will coordinate with relevant agencies to obtain blanket forestry and environmental clearances for projects.

2.8. Electricity Act of Bhutan 2001

The Electricity Act of Bhutan was enacted by the National Assembly and the objectives of this act are as follows:

i. To promote a safe and reliable supply of electricity throughout the country;
ii. To enhance revenue generation through export of electricity;
iii. To develop socio-economic welfare of the people;
iv. To promote economic self-reliance of the country through the development of a financially viable and reliable electricity industry;
v. To promote development of renewable energy resources;
vi. To take environmental considerations into account when developing the electricity supply industry; and
vii. To promote efficiency in management and service delivery.

Few clauses from Part 5 of this Act regarding the power to acquire land and water is relevant to the proposed project. It states that;

- Where any land under private ownership is required to be acquired for setting up a project under license pursuant to Part 3, the land may be acquired under the prevailing Land Act on approval of the Minister and such acquisition shall be deemed for a public or national interest. (Section 51.1)
- Where the minister is satisfied that the land under subsection 51.1 is required for the purpose of providing or maintaining electricity supply services to the public, and that it is required in the public or national interest, regardless whether the Licensee is a public or private entity, the Minister shall pursue the acquisition of the land on behalf of the Licensee in accordance with the Land Act. (Section 51.2)
- Once a right of way has been granted to a Licensee by the Authority, no person shall build any structures or do any activity on land within the proximity of the area covered under the right of way without the prior approval of the Authority. (Section 51.5)

2.9. Forest and Nature Conservation Act (2023)

This Act repeals the Forest and Nature Conservation Act 1995 and the objective of this Act is to establish provisions for safeguarding and responsibly utilizing Bhutan's forests, wildlife, and associated natural resources for the welfare of both current and future generations. According to this act, State Reserved Forest Land (SRFL) shall constitute any land in Bhutan which is not State Land or private registered Land. Any activity carried out in the SRFL shall require forestry clearance, issued by the DoFPS.

Protected Areas are regulated under this act. Mammals, birds, plants, fish, insects, reptiles, amphibians, tortoise and turtle are categorized either as Schedule I, II or III and accordingly protected.

Fishing is any river, stream, lake or natural pond other than restricted area in SRFL shall be regulated by DoFPS as per the procedure prescribed in the Rules.

The Section 70 of the Act states that the compensatory plantation in State Reserved Forest Land shall be carried out by the agency responsible for deforestation or damage caused to the forest produce for taking up any developmental activity.

2.10. Forest and Nature Conservation Rules & Regulations (2023).

The Regulation states that the DoFPS shall delegate the authority to issue forestry clearance to the Division and Park Office as follows:

i. Any activity up to 3 acres of the area or 3 km length by the Range Office;
ii. Any activity more than 3 acres of area up to 7 acres or more than 3 km up to 7 km length by the Division or Park Office; or
iii. Any activity more than 7 acres of area or more than 7 km of length by the Head of Department.

The Department or authorized agency may carry out plantation, reforestation, afforestation, voluntary plantation, and compensatory plantation as per the technical guidelines issued by the Department in accordance with Section 67 to 70 of the FNCA Act. Further, the prevailing norms also states funding shall be for double the area taken up by the project. The fund shall be made available prior to project commissioning, based on DPR or DoFPS's financial estimate. The compensatory plantation program may also extend to other potential SRF areas.

2.11. Land Act of Bhutan 2007

Land Act 2007 is the latest and revised version of the previous Land Act 1979. The Act intends to manage, regulate and administer the ownership and effective use of land resources and conservation of ecosystem. Some of the clauses from *Chapter 7 (Acquisition of Registered Land)* and *Chapter 12 (Easement)* of this Act are relevant to the proposed transmission line project where it states that;

- The landowner of a piece of land is bound, subject to reasonable compensation being paid to him, to allow the laying through his land of water pipes or irrigation channel, drainage pipes, telecommunication structures, electricity poles and sub-stations or other similar installations by a government agency or for the use of the adjoining or neighboring land if, without making use of his land, they could not be laid or could be laid only at an excessive cost. The landowner may require that his interests be taken into consideration.
- The Government may acquire a registered land for public interests.
- The Government may provide substitute land or cash payment, or both, as compensation.
- Acquisition of land shall entail a fair compensation.
- For rural areas, the landowner shall have the discretion to opt for substitute land or cash compensation offered by the government. In the case of a Thromde, the landowner shall be provided cash compensation. If the land is the only plot owned by the landowner in the Thromde, the government shall consider a substitute land in the same Thromde. If the value of substitute land is inadequate, additional cash compensation shall be provided subject to the value of land.
- Compensation shall be provided for the immovable property on the acquired land.
- Upon acquisition, if the remaining land parcel is less than 10 decimals, such land both in Thromde and rural areas shall also be acquired.
- The location of substitute land to be allotted in rural areas shall be in the order of preference of same village, Gewog, and Dzongkhag.
- The land under acquisition shall be taken over only after registering the substitute land in the name of the affected landowner or the cash compensation has been made to the landowner.

The proposed project is bound to affect few private lands and the provisions contained in the Act shall govern all the issues related to land acquisitions and compensation schemes.

2.12. Land Acquisition and Compensation Rules and Regulations 2022

In exercise of the power granted by the Land Act of Bhutan 2007, the National Land Commission (NLC) has framed the Land Acquisition and Compensation Rules and Regulations 2022. These rules and regulations aim to ensure fair provision of land substitutes or cash compensation at the appropriate time when government institutions acquire private land for public interest purposes.

Some of the provisions of this Rules & Regulations that are relevant to the proposed project are as discussed below;

- The private registered land shall be acquired only under unavoidable circumstances.
- The private registered land under acquisition shall be taken over only after registering the land substitute or payment of cash compensation to the landowner.
- If the remaining land parcel after the acquisition is less than 10 decimals, such land shall be acquired or may be consolidated with the available State land adjoining the registered land of the same landowner.
- The acquisition of land less than 10 decimals prevalent before the enactment of the Act shall be eligible for a proportionate land substitute.
- Allotment of a land substitute shall not enclose any patch of State land inside its boundary.
- If the land substitution process is delayed, the project may choose to lease the proposed land until the substitution is complete. This can be done through a formal agreement between parties. However, this option is restricted to National strategic projects.
- The private registered land acquisition and the land substitute for power transmission and distribution structures shall be in accordance with the Rules and Regulations or Guidelines of the agencies concerned. In the event of any inconsistency or unavailability, these LACRR shall prevail.
- The private registered land acquisition shall entail a fair compensation.
- The compensation for the acquired land shall be as per the land type recorded in *Thram*.
- The valuation and fixation of the land value and any other collateral property shall be in accordance with the rate determined by the PAVA and Bhutan Schedule Rate.
- The compensation rates for crops and trees shall be as prescribed by PAVA.
- The acquiring agency shall utilize or develop the land within three years from the date of approval. However, non-utilization of the acquired land within the stipulated time or for the intended purpose shall be reverted to State land.

2.13. Distribution System Master Plan (DSMP 2020-2030).

The primary objectives of the DSMP (2020-2030) include conducting a comprehensive study of the current distribution network to formulate a strategic distribution plan covering the next ten years. This plan aims to ensure the provision of affordable and sufficient electricity while minimizing losses, enhancing power quality and reliability, optimizing resources, and prioritizing excellent customer service. Additionally, the DSMP aims to develop annual investment plans to support the implementation of the strategic distribution plan, thereby facilitating continuous improvement and development in the distribution network.

2.14. Water Act of Bhutan 2011

The Water Act of Bhutan was promulgated by the Parliament of Bhutan in 2011. The main purposes of this act are to;

i. To ensure that the water resources are protected, conserved and/or managed in an economically efficient, socially equitable and environmentally sustainable manner.
ii. To establish suitable institutions.
iii. To grant water resources right to every individual to have access to safe, affordable and sufficient water for basic human needs.

The Chapter 8 of the Act which might be relevant to this project states that;

i. Except as otherwise provided in this Act, a person may not discharge any effluent directly or indirectly to any water resource unless the discharge is in compliance with the Effluent Discharge Standard.
ii. Effluents must be treated using best available technology before discharging into the environment.
iii. Notwithstanding any other provisions, it shall be unlawful to discharge any chemical, radiological, radioactive, medical or any other hazardous waste into water bodies.
iv. Any person discharging effluent shall be liable to pay a charge as prescribed in the regulations under this Act.
v. Any person who acts in breach of the provisions of this section shall be guilty of an offence under this Act.

The proposed project is an over-head project and tower installations and workers camp sites will be located at a safe distance from watercourses. Therefore, the project will have least possible impacts on water resources.

2.15. The Water Regulation of Bhutan 2014

The Water Regulation of Bhutan was adopted and promulgated by the National Environment Commission Secretariat (NECS) in 2014 for the effective enforcement of the objectives and purposes of the Water Act of Bhutan 2011.

The chapter 5 of this Water Regulation under Temporary Water Users topic which might be relevant to this project states that, any new water users from an existing water facility, whether it is for temporary use or for a length of duration, will first consult and obtain consent from the concerned Water Users' Association (WUA) or water users. If the proposed water source for abstraction does not fall under any WUA of water users, the permit for such water use will be obtained from the concerned Gewog Administration.

2.16. The Waste Prevention & Management Act 2009

The Waste prevention and Management Act of Bhutan was enacted in 2009 with main purposes to protect, sustain human health through protection of environment by:

i. Reducing the generation of waste at source
ii. Promoting the segregation, reuse and recycling of wastes
iii. Disposal of waste in an environmentally sound manner and
iv. Effective functioning and coordination among implementing agencies.

It states that: All developmental activities that generate waste shall be planned and executed in harmony with the carrying capacity of the country's fragile ecological settings and geographical terrains. A person polluting the environment or causing ecological harm shall be responsible for the costs of avoidance, containment, abatement, medical compensation, mitigation, remediation and restoration.

2.17. The Waste Prevention and Management Regulation 2016

The Waste Prevention and Management Regulation, 2012 shall be called as Waste Prevention and Management (Amendment) Regulation, 2016. It came into effect on 8th November, 2016 and shall extend to whole of Bhutan. The relevant points of the Regulations are:

- Establish procedures to implement the purpose of the Waste Prevention and Management Act, 2009;
- Identify roles and areas of implementation of the implementing and collaborating agencies for the purpose of establishing a sound waste management system including monitoring procedures at every organization level, through efficient collection, segregation, treatment, storage, transportation, reduction, reuse, recycling and safe disposal of solid, liquid and gaseous wastes.
- Assign costs in proportion to the waste volume generated from the point source or by degree of their hazardousness by levying fees, charges and fines for non-compliance;

- Control and prohibit illegal dumping or releasing of waste into the environment;
- Establish strategy and procedure to achieve zero waste;

Introduce a system of incentives for waste prevention and management on the principle that waste is an asset.

2.18. The Biodiversity Act 2022

This Act repeals the Biodiversity Act of Bhutan 2003 and subsidiary legislations framed and adopted thereunder, and section 73 of the NEPA 2007. The chapter 7 of the Act on Fair and Equitable Sharing of Benefits discusses on the economic, social, technical, scientific, environmental or any other benefits that are intended or may be likely to be accrued to the country and an indication of the types of short, medium- and long-term benefits to be shared with the RGoB and other relevant stakeholders as well as the proposed mechanisms and arrangements for benefit sharing.

2.19. Regulation on Occupational Health and Safety for Construction Industry and Safety Regulations 2012

The purpose of this regulation is to establish occupational health and safety standards on construction safety read with relevant provisions enshrined in "Regulation on Occupational Health, Safety and Welfare," as applicable to construction sites. It is to ensure safety and health for employees, as well as other person at construction sites, from work related risks to their health, safety, and wellbeing as provided in Chapter IX of the Labour and Employment Act, 2007.

One of the keys to the Regulation is: at construction site there shall be appointed, organized and maintained a health and safety committee, and a Safety Officer conforming to the "Regulation on Occupational Health, Safety and Welfare." It talks about fire protection, emergency action plan, the maximum weight that adult men can lift is 50 kg and adult women 25 kg, safety in the tunneling and excavation, scaffoldings, safety in the transport and earth moving equipment, plant equipment, demolition, explosives, medical facilities, offences and penalties.

2.20. Environmental Standards 2020

National ambient air quality standards establish upper limits on the concentration of air pollutants in outdoor air for the protection of human health, agricultural and natural vegetation and ecosystems, and the environment in general.

3. PROJECT DESCRIPTION

3.1. Project Overview

The BPC, the responsible agency for transmission and distribution of electricity in the country, is working in tandem with DGPC for evacuation of hydropower electricity from the proposed 26MW Druk Bindu hydropower projects (18MW stage-I & 8MW stage-II).

The power generated at the Druk Bindu hydro power station, which has a capacity of 31 MVA, will be transmitted via a 66 kV single circuit on a double circuit tower. This transmission line spans approximately 14 kilometers and connects to the Jogimara substation, which operates at 66/33/11 kV, located at Jogimara, Tashichholing (Sipsoo). The primary objective is to facilitate power transmission from the 26MW Druk Bindu HPPs, the project will also enhance and ensure the reliability of power supply for various developmental activities in the southern regions.

Table 3-1: Scope of the Project (Druk Bindu TL)

Voltage	From - To	Capacity	Nos of circuit	Length
66 kV	Druk Bindu HP – Jogimara SS	31 MVA(*1)	1 (*2)	Approx. 14 km
Note: *1: Power factor = 0.85 *2: Single circuit on double circuit tower				

3.2. Location and Alternatives

The site location and transmission line route are depicted in Map 3-1. The terrain in this area comprises deep valleys, dense bushes, and steep slopes, with pockets of sub-tropical warm broadleaved forests dotting the landscape. The designated route traverses through villages, small streams, the Sipsu-Tendu road, deep valleys, varied terrain, private lands, orchards, and runs parallel to the India-Bhutan border until reaching its termination point at the Jogimara substation.

There are two proposed options for the line route.Route B follows the original route suggested by BPC, passing through hilly terrain. Route A, however, presents a modified route aimed at minimizing the passage through private lands to mitigate potential impacts on the public and anticipate future disputes with landowners.

While the initial survey for Route B was conducted in 2016, BPC is now considering Route A as the preferred route following the first JICA survey conducted in November 2023.

3.2.1. Alternatives to Transmission Line

Binduchhu, where the Druk Bindu site is planned, is a small river with a total river length of 13.5 km to the border with India and a basin area of about 100 km^2. In addition, there are no areas within the basin that require special consideration in terms of the environmental and social conditions. For these reasons, the plan to construct a power plant in the river is to build a water intake at the confluence with a relatively large tributary from the viewpoint of economic efficiency, and to build a power plant close to the Indian border where a larger head can be obtained.

Focusing on other rivers in Samtse Province, rivers other than Binduchhu (Jiti Khola, Daina Khola), where Druk Bindu is located, have a gentle slope and no suitable site for the construction of hydroelectric power plants can be found.

In addition, the electricity generated by the power plant will be transmitted to the Jogimara substation, which is located about 14 km to the south. Therefore, the location of the power plant will be in a location that meets two conditions: close to the Indian border and where it is possible to construct a transmission line (66 kv) for the transmission of power to the substation.

From the viewpoint of satisfying the above two conditions, the two possible route proposals for the construction of power lines were discussed.

Table 3-2: Results of comparative study of two potential Transmission Lines

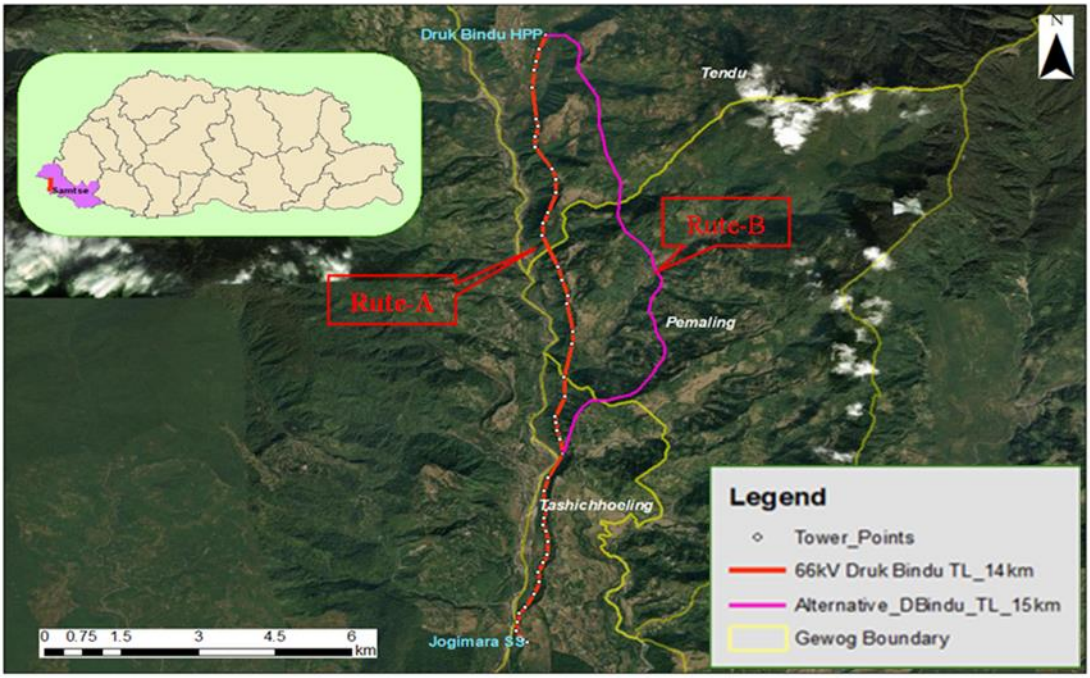
Evaluation item	Route - A		Route-B		Without Project Option	
Length	14.1 km		13.7 km			
No. of Towers	46 towers		54 towers			
Natural (physical) environment	‣ Few forest cutting, as existing roads can be can be used. ‣ There is no need to construct a new access road.	B	‣ The deforestation area due to the new access road will be significant, because there are many steep slopes.	C	‣ Negative impacts on forests and ecosystems can be avoided.	A
Resettlement	‣ No Resettlement, but land acquisition for tower foundation site is needed. (3 sites)	B	‣ Much of land acquisition for tower foundation sites are needed. (more 7 sites)	C	‣ Negative impacts on privately owned land can be avoided. ‣ Local employment cannot be expected.	A
Technical and construction difficulty	‣ There is a lot of flat land, so there are few problems.	A	‣ The steep terrain makes construction challenging.	C	‣ The local economy will not be revitalized because the development of these areas will not be carried out. ‣ Regional disparities are not improving.	C
Construction cost	‣ There are no factors that would make the cost of the product higher.	A	‣ Cost is high due to the establishment of access roads.	C		

					‣ The reliability of the local power supply does not improve. ‣ The shortage of electricity during the dry season expands.	
General evaluation points	**Medium extent of the impact**	**A**	**Serious extent of the impact**	**C**	**Serious extent**	**C**

Note: A=Minor, B=Major, C=Significant

As a result of the comparative study, Route-A is superior in terms of natural and social environment, technology, and economic efficiency.

Based on the above results, the Route-A proposal was adopted. In addition, it was decided to construct a power plant in this area that can be connected to the Route-A plan.



Map 3-1: Alternative of Transmission Line, Route-A and Route-B

The proposed transmission line aims to achieve the following objectives:

i. To facilitate the evacuation of power generated from the proposed 26MW Druk Bindu Hydropower Plant.

ii. To enhance power supply reliability in the Southern region.

To support and ensure reliability for various developmental activities in the Southern Regions.

Table 3-3: The Geographical co-ordinates outlining the route of the TL

SN	Tower_No.	Latitude	Longitude	Elevation (m)	Span_m	Location Descriptions
1	**AP-00_(HPP)**	27.12269	88.879	757		Location: Borale, Tendu, Samtse.
2	**AP-1**	27.11981	88.87779	843	353	Location: Borlane, Tendu, Samtse, Hilltop need to do benching. Land Type: Government Land.
3	**AP-2**	27.11738	88.87723	858	276	Location: Borlane, Tendu, Samtse. Hilltop and minimum benching id needed. Land Type: Government Land.
4	**AP-3**	27.11571	88.87695	870	188	Location: Borlane, Tendu, Samtse. Hilltop with minimum benching needed. Land Type: Government Land.
5	**AP-4**	27.11214	88.87651	826	401	Lcation: Selwithang, Tendu, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.
6	**AP-5**	27.10591	88.87717	812	695	Lcation: Selwithang, Tendu, Samtse. Given the limited space available, an unequal leg extension is proposed instead of extensive benching to enhance stability during construction and Minimise the cost. Land Type: Government Land.
7	**AP-6**	27.10456	88.8776	875	168	Lcation: Selwithang, Tendu, Samtse. Given the limited space available, an unequal leg extension is proposed instead of extensive benching to enhance stability during construction and Minimise the cost. Land Type: Government Land.
8	**AP-7**	27.10238	88.8771	903	249	Location: Dawathang, Tenduk, Samtse. Flat Ground with Zero Benching. Land Type: Government Land.
9	**AP-8**	27.10028	88.87704	893	233	Location: Dawathang, Tenduk, Samtse. Flat Ground with Zero Benching. Land Type: Government Land.
10	**AP-9**	27.09606	88.88	846	555	Location: Kuengaling, Tendu, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.
11	**AP-10**	27.09381	88.88068	809	261	Location: Kuengaling, Tendu, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.

SN	Tower_No.	Latitude	Longitude	Elevation (m)	Span_m	Location Descriptions
12	**AP-11**	27.09122	88.88077	777	289	Location: Nunpani, Tendu, Samtse. Maximum benching is needed. Land Type: Government Land.
13	**AP-12**	27.08722	88.87939	807	466	Location: Kuengalig, Tendu, Samtse. Flat Ground with zero benching needed. Land Type: Private Land.
14	**AP-13**	27.08517	88.87846	794	246	Location: Kuengaling, Tendu, Samtse. Flat Ground with zero benching needed. Land Type: Government land.
15	**AP-14**	27.08273	88.87833	784	271	Location: Kuengaling, Tendu, Samtse. Flat ground with minmum benching. Land Type: Government land.
16	**AP-15**	27.07646	88.881	752	745	Location: Goiri Kholtsha, Pemaling, Samtse. Flat Ground with zero benching needed. Land Type: Government land.
17	**AP-16**	27.07393	88.88171	739	290	Location: Yurungthang, Pemaling, Samtse. Flat Ground with zero benching needed. Land Type: Government land.
18	**AP-17**	27.07078	88.88272	718	364	Location: Yurungthang, Pemaling, Samtse. Flat Ground with zero benching needed. Land Type: Government land.
19	**AP-18**	27.06924	88.88258	707	172	Location: Yurungthang, Pemaling, Samtse. Flat Ground with zero benching needed. Land Type: Private Land.
20	**AP-19**	27.0635	88.88362	675	646	Location: Thangchena, Pemacholing, Samtse. Flat ground with zero benching needed. Land Type: Government Land.
21	**AP-20**	27.06119	88.88358	664	257	Location: Thangchena, Pemacholing, Samtse. Flat ground with zero benching needed. Land Type: Government Land.
22	**AP21**	27.0546	88.88214	591	749	Location: Ramdale, Tashichholing, Samtse. Hill top with minimum benching needed. Land Type: Government Land.
23	**AP-22**	27.05061	88.88233	515	450	Location: Lapsechok, Tashichholing, Samtse. Hilltop with Maximum benching. Land Type: Government Land.

SN	Tower_No.	Latitude	Longitude	Elevation (m)	Span_m	Location Descriptions
24	**AP-23**	27.04669	88.88055	515	470	Location: Gophadangra, Tashichholing, Samtse. Flat ground with zero benching needed. Land Type: Government Land.
25	**AP24**	27.04538	88.88068	508	146	Location: Gophadangra, Tashichholing, Samtse. Hilltop with Maximum benching. Land Type: Government Land.
26	**AP25**	27.04394	88.88087	476	164	Location: Laptsechok, Tashichholing, Samtse. Flat ground with zero benching needed. Land Type: Government Land.
27	**AP26**	27.04251	88.88136	496	167	Location: Semal Dangra, Tashichholing, Samtse. Hilltop with Minimum Benching. Land Type: Government Land.
28	**AP-27**	27.04209	88.88147	497	48	Location: Semal Dangra, Tashichholing, Samtse. Hill top with Maximum Benching. Land Type: Government Land.
29	**AP-28**	27.03937	88.88189	430	312	Location: Semal Jue, Tashichholing, Samtse. Hill top with Maximum Benching needed. Land Type: Government Land.
30	**AP-29**	27.03449	88.87925	362	606	Location: Suthrupe, Trashichholing, Samtse. Flat ground with zero benching. Land Type: Government Land.
31	**AP-30**	27.03179	88.87865	360	306	Location: Sathrupe, Tashichholing, Samtse. Flat ground with minimum benching. Land Type: Government Land.
32	**AP-31**	27.02986	88.87864	383	215	Location: Sathrupe, Tashichholing, Samtse. Hilltop with minimum benching. Land Type: Government Land.
33	**AP-32**	27.02802	88.87889	402	207	Location: Sathrupe, Tashicholing, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.
34	**AP-33**	27.02651	88.87863	361	175	Location: Sathrupe, Tashicholing, Samtse. Hilltop with minimum benching needed. Land Type: Government Land.
35	**AP-34**	27.025	88.87852	426	180	Location: Sathrupe, Tashicholing, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.

SN	Tower_No.	Latitude	Longitude	Elevation (m)	Span_m	Location Descriptions
36	**AP-35**	27.02388	88.87901	408	135	Location: Sathrupe, Tashicholing, Samtse. Hilltop with minimum benching needed. Land Type: Government Land.
37	**AP-36**	27.02184	88.87934	374	231	Location: Sathrupe, Tashicholing, Samtse. Hilltop with minimum benching needed. Land Type: Government Land.
38	**AP-37**	27.01908	88.87914	360	307	Location: Sathrupe, Tashicholing, Samtse. Flat ground with zero benching. Land Type: Government Land.
39	**AP-38**	27.01751	88.87843	349	188	Location: Sathrupe, Tashicholing, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.
40	**AP-39**	27.01567	88.87757	343	221	Location: Sathrupe, Tashicholing, Samtse. Hilltop with maximum benching needed. Land Type: Government Land.
41	**AP-40**	27.01372	88.87775	350	217	Location: Sathrupe, Tashicholing, Samtse. Hilltop with minimum benching needed. Land Type: Government Land.
42	**AP-41**	27.01138	88.87695	323	273	Location: Chekshing, Tshichholing, Samtse. Flat ground with zero benching. Land Type: Government Land.
43	**AP-42**	27.00876	88.87536	326	331	Location: Jogimara, Tashishholing, Samtse. Present of Boulder and benching is needed. Land Type: Government Land.
44	**AP-43**	27.00754	88.87427	353	176	Location: Jogimara, Tashishholing, Samtse. Flat Ground with Zero benching. Land Type: Private Land
45	**AP-44**	27.00581	88.87392	353	195	Location: Jogimara, Tashishholing, Samtse. Flat Ground with Zero benching. Land Type: Government Land.
46	**AP-45**	27.00404	88.87378	353	197	Location: Jogimara, Tashishholing, Samtse. Flat Ground with Zero benching. Land Type: Government Land.
47	**AP-46**	27.00219	88.87495	344	236	Location: Jogimara, Tashishholing, Samtse. Maximum benching needed. Land Type: Government Land.
48	**AP-47_SS**	27.00167	88.87572	346	96	Existing Substation 66/33kV

3.3. Project Components

Building of transmission line entails the following stages of work for each of the several towers to be constructed:

3.3.1. Construction access and tree clearing

This is the first activity in the process of constructing transmission line. The land identified for location of transmission tower needs to cleared. If there is no existing access to the site already, footpaths or access roads to the site needs to be constructed. This will entail removal of trees and vegetation in the areas identified for tower location and access road.

3.3.2. Mobilizing equipment and delivering material

Once access to the tower location sites is ready, construction equipment and materials needs to be mobilized and transported to the site.

3.3.3. Foundation construction

Depending on the size of transmission towers, construction of foundations and tower footings will not only entail cutting and leveling of the site, but also require concreting work.

3.3.4. Installing the structure

Tower structure assembly entail putting together the metal frames of the tower including the tower arms and insulators.

3.3.5. Stringing conductors

This is the final construction activity entailing laying of the conductor cables.

3.4. Implementation Schedule

The construction of the 66kV Druk Bindu transmission line, spanning approximately 14km, is expected to require **eighteen (18) months**, accounting for a construction break during the rainy season. Transporting materials and laying foundations proves challenging during this period, which typically begins in June and concludes in the first week of September.

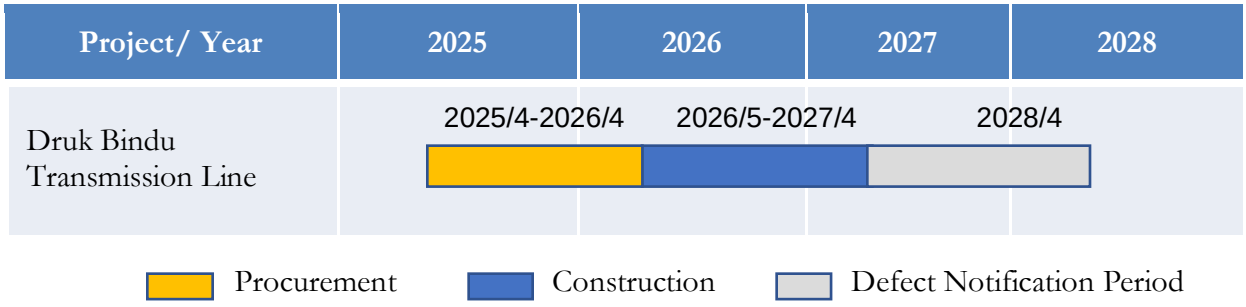


Figure 3-1: Tentative Implementation Schedule for 14km 66kV S/C Druk Bindu PTL project

4. ENVIRONMENTAL AND SOCIAL BASELINE STATUS

4.1. Environmental Conditions

4.1.1. Physiography

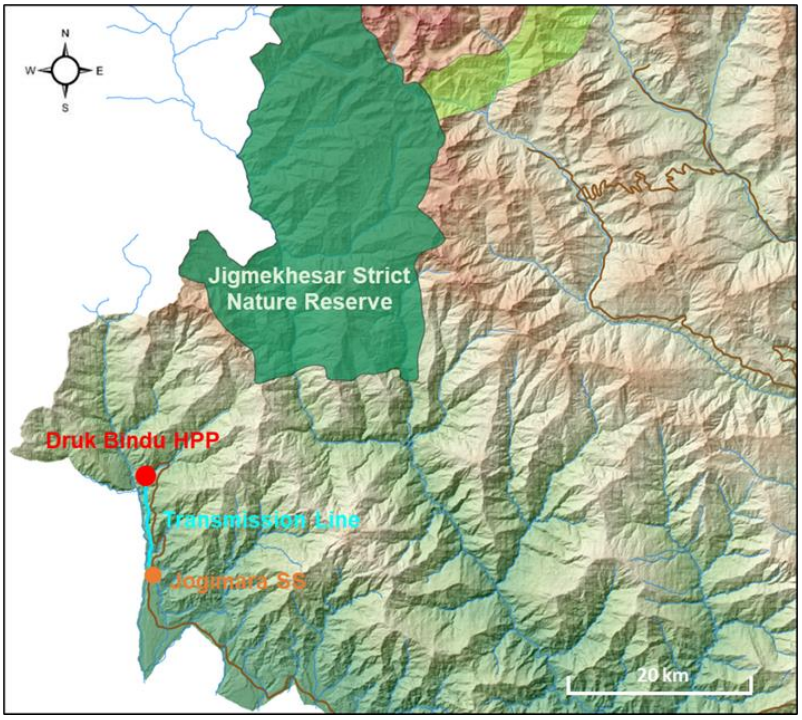
The physiography of the project area is typical of the Himalayan foothills gradually rising northwards into rugged terrains comprised of narrow valleys, deep gorges and steep mountain sides. The project area begins at the confluence of Druk Bindu and Jaldaka river on the southern border towards India with elevations gradually rising northwards the catchments areas of Druk Bindu river. The elevation of the project area ranges between 375 masl at Jogimara to ~1200 masl.

4.1.2. Climate

The project falls in the sub-tropical climate and vegetation zone characterized by four seasons. The area has hot and humid summers with high precipitation, spring and autumn seasons are warm and pleasant, and winters are cold. Owing to the rugged terrain of the project area, temperatures are highly variable across short distances.

4.1.3. Protected Area

The project area does not fall in any protected area. The Jigmekhesar Strict Nature Reserve (JKSNR) is the nearest protected area located northeast about 15 km crow flight distance.



(Source: JICA Survey Team)

Figure 4-1: Location of the project site and Protected Area

4.1.4. Ambient Environmental Quality

Ambient Air Quality

The ambient air quality for the dry season were measured in three locations across the project area.

The measurement was conducted for two days on 15th and 17th February, 2024.

The entire village area is a remote mountainous area, and there is almost no influence of automobile exhaust and noise or human activities such as construction work throughout the year.

For this reason, it is assumed that the air quality is stable throughout the year, so the air quality was measured once during the dry season, when the measured value is maximum throughout the year.

The results are given in Table 4-1.

Table 4-1: Ambient Air Quality during the dry season at Tendu, Biru, and Sipsu

SL. No	Parameters *Max.P.L (NECS Standards 2020)*	UOM	Result					
			Tendu		Biru		Sipsu	
			Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
1	TSPM *200 (24hr Avg.)*	µg/m³	89.056	67.78	73.22	75.19	90.08	85.46
2	$PM_{2.5}$ *60 (24hr Avg)*	µg/m³	62.50	47.56	30.48	32.60	57.80	50.41
3	PM_{10} *100 (24hr Avg)*	µg/m³	76.23	57.79	42.73	42.58	75.53	69.56
4	Conc. Of Sulphur Dioxide (SO_2) *80 (24 hr avg.)*	µg/m³	0	0	0	0	0	0
5	Conc. Of Nitrogen Dioxide (NO_2) *80 (24hr avg.)*	ppm	0.121	0.132	0.90	0.65	0.146	0.164
6	Conc. Of Carbon Monoxide (CO) *2000 (8hr avg.)*	ppm	0	0	0	0	0	0
7	Atmospheric Pressure	mbar	909.63	906.19	951.97	951.96	952.84	949.61
8	Wind Speed (WS)	m/sec	0.270	0.412	---	---	0.497	0.348
9	Temperature	° C	19.69	20.49	24.03	24.16	23.03	22.06
10	Relative Humidity	%	53.12	57.01	57.57	55.97	53.87	62.29

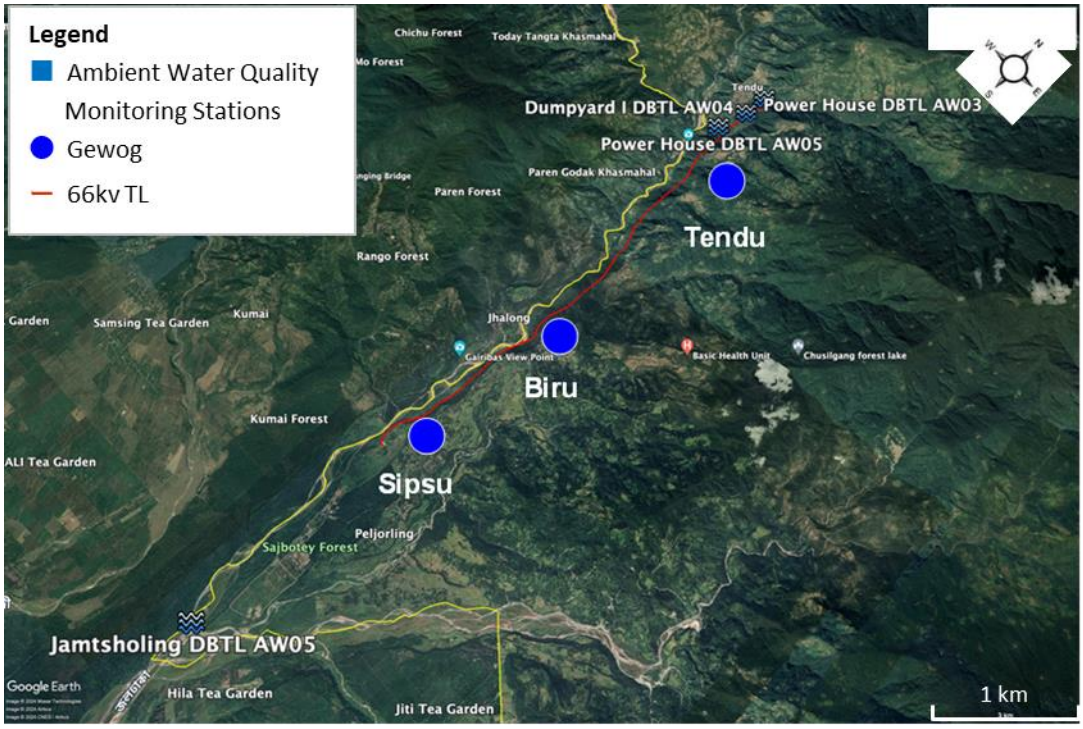
Ambient noise levels

The pre-project ambient noise level in the project area were measured at three places in the project area. The results are presented in the Table 4-2.

Table 4-2: Average Sound Pressure Level (SPL) in Tendu, Biru and Sipsu (*Db*)

Max. permissible level as per NEC, 2020	Location					
	Tendu		Biru		Sipsu	
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
65 (Day)	48.07	48.86	50.92	45.97	37.32	36.88
55 (Night)	46.16	47.46	44.92	42.25	36.70	37.73

In all the three sampling locations, concentration of particulates and noise level are within the national maximum permissible limits. Similarly, the gaseous pollutants such as Carbon Monoxide (CO) & Sulphur Dioxide (SO_2) were not detected in all sampling sites. However, the concentration of Nitrogen Dioxide (NO_2) level was detected.



Map 4-1: Ambient Air Quality (above) and Noise level (below) sampling locations (3 sites)

4.1.5. Ecological Resources

Terrestrial

The results of the terrestrial surveys conducted during the wet season and dry winter season generated the status of plants, mammals, birds, and reptiles and amphibians in the project area.

1) Flora

i. Rainy Season

The number of tree species found growing in the forest during the rainy season survey was 112 as bellows. The list of confirmed trees is listed in Appendix-3.

Table 4-3: Main Trees identified in the proposed Transmission Line construction area

Sl. No.	Scientific Name	Common name	IUCN Status
1	*Acer thomsonii*	Deciduous tree	LC
2	*Ailanthus integrifolia*	Evergreen tree	LC
3	*Albizia chinensis*	Evergreen tree	-
4	*Artemisia sp*	Deciduous tree	LC
5	*Bauhinia purpurea*	Deciduous tree	LC
6	*Brassaiopsis hainla*	Evergreen tree	-
7	*Chomolaena odorata Clerodendrum*	Subshrub Deciduous tree	-
8	*viscosum*	Subshrub Deciduous tree	-
9	*Engelhardia spicata*	Evergreen tree	-
10	*Erythrina sp*	Deciduous tree	-
11	*Ficus cunia*	Evergreen tree	-
12	*Ficus roxburghii*	Evergreen tree	LC
13	*Lantana camara*	Deciduous tree	-
14	*Maesa chisia*	Evergreen shrub	-
15	*Osbeckia sp*	Deciduous tree	-
16	*Ostodes paniculata*	Evergreen tree	LC
17	*Premna sp*	Evergreen tree	-
18	*Schima wallichii*	Deciduous tree	LC
19	*Solanum nigrum*	Deciduous tree	-
20	*Solanum torvum*	Deciduous tree	-
21	*Talauma hodgsonii*	Evergreen tree	LC
22	*Tetrameles nudiflora*	Deciduous tree	LC

Note; LC=Least Concern (Source: Tashichholing Range Office)

ii. Dry Season

The number of tree species found growing in the forest during the dry season survey was 110 species. All plant species recorded during the field survey fall under least concern and not list categories under IUCN redlist species. The list of confirmed trees is listed in Appendix-3.

Species diversity index

The species diversity for each sampling plot were assessed using a Shannon's diversity index. Shannon's diversity index provides a comprehensive metric to compare the species diversity amongst different sites by taking into consideration both species richness and species abundance. Lower value indicates lower diversity and higher value indicate higher plant diversity. Specifically, Shannon index between 0–1.5 is considered as low diversity, 1.5–3 as moderate diversity and above 3 as high diversity. The formula for Shannon diversity index is shown below:

$$H' = -\sum_{i=1}^{n} pi * lnpi$$

Where:

- Σ: A Greek symbol that means "sum"
- ln: Natural log
- P_i: The proportion of the entire community made up of species i

The overall Shannon diversity index for the hydropower region is calculated to be 4.35. (Table 4-4). This suggest that the hydropower area is rich and diverse ecosytem with a wide variety of plant species and relatively even abundances across those species. However, plot wise diversity indices show that most plots fall under moderately diverse areas (2.23–2.90), with one plot even falling under low diverse area (1.33).

Table 4-4: Plot wise plant diversity index along transmission line

Plot ID	**DBTL 01**	**DBTL 02**	**DBTL 03**	**DBTL 04**	**DBTL 05**	**DBTL 06**	**DBTL 07**	**DBTL08**
Shannon Index	2.77	2.56	2.54	2.42	2.34	2.23	2.64	2.76
Plot ID	**DBTL 09**	**DBTL 10**	**DBTL 11**	**DBTL 12**	**DBTL 13**	**DBTL 14**	**DBTL 15**	**Overall diversity**
Shannon Index	2.63	2.72	2.90	2.63	2.69	2.39	1.33	4.35

Tree count, density and volume

The number of trees per unit area is an important measure of stand density. During the field enumeration trees with diameter at breast height (DBH) above 10 cm were recorded as trees regardless of their heights and rest were categorized into shrubs, climbers, and herbs. A total of 142 trees, 141 shrubs, 40 climbers and 24 herbs from 15 different plots were recorded.

Tree density and volume is by far the most important metric since it possesses important economic value. The tree density and average volume per tree (cft) for each plots is shown in Table 4-5. The average tree density for entire transmission line is calculated to be 355.55 ± 135.43 trees/hectar, whereas average tree volume (cft) is calculated to be 29.5 ± 24.95 cft. Hence, on average every hectare of land cleared for transmission line would cause approximate removal of 355 ± 135 trees that amounts to 10,869.76 ± 11271.28 cft.

Table 4-5: Tree density and average volume per tree

Plots	**DBTL01**	**DBTL02**	**DBTL03**	**DBTL04**	**DBTL05**	**DBTL06**	**DBTL07**	**DBTL08**
Density/hectare	311.11	133.33	311.11	355.56	311.11	444.44	311.11	533.33
Avg. Volume (cft)	38.48	5.71	4.52	43.22	49.73	21.08	14.41	15.92
Plots	**DBTL09**	**DBTL10**	**DBTL11**	**DBTL12**	**DBTL13**	**DBTL14**	**DBTL15**	
Density/hectare	311.11	577.78	311.11	622.22	311.11	177.78	311.11	
Avg. Volume (cft)	5.52	8.02	80.58	69.39	42.74	42.02	1.18	

Note: Tree volume is calculated using true circle formula multiplied by the height of tree.

2) Fauna

i. Rainy Season

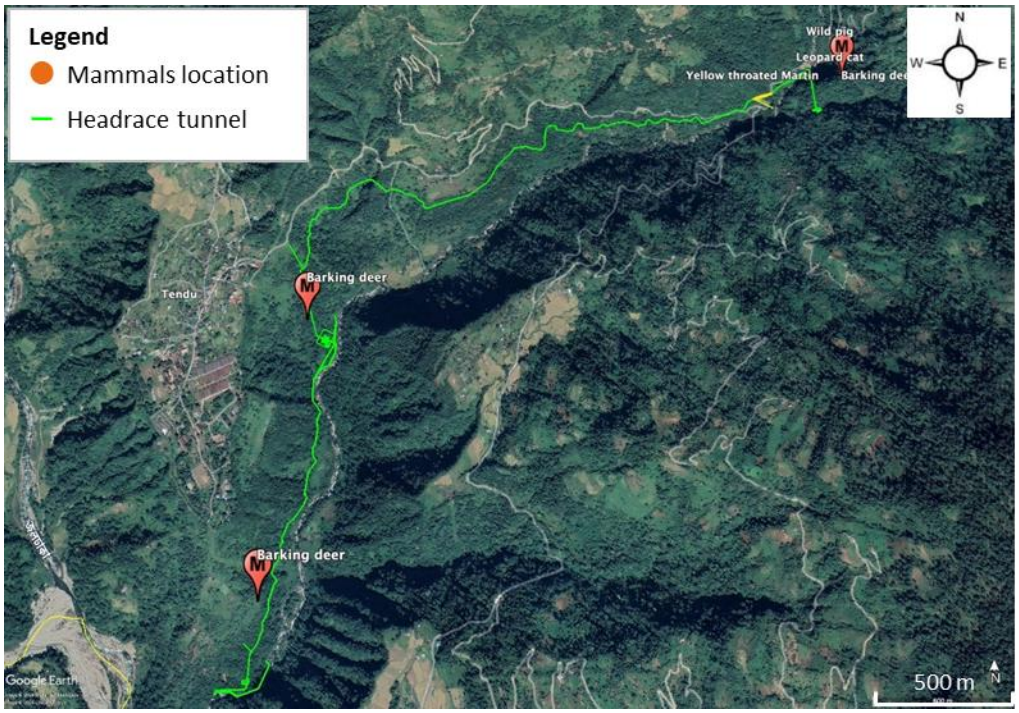
Animal habitat surveys for and Mammals, Birds, Heretofauna and Insects were conducted during the rainy season and 5 mammal species, 78 bird species, 2 Herpetofauna and 26 insect species were confirmed to be present along the proposed project site. (See Appendix-4 on List of Birds)

Table 4-6: Mammals identified in the proposed Transmission Line construction area

Sl. No.	Scientific Name	Common name	IUCN Status
1	*Elephas maximus*	Asian Elephant	EN
2	*Sus scrofa*	Wild Boar	LC
3	*Felis sp*	Small cat	LC
4	*Panthera pradus*	Common Leopard Malayan Giant	VU
5	*Ratufa bicolor*	Squirrel	NT

Note; EN=Endangered, LC=Least Concern, VU=Vulnerable, NT=Near Threatened

(Source: Tashichholing Range Office)



(Source: JICA Survey Team)

Map 4-2: Location of the Study Points mammals along Transmission Line and Power Site (2-1)

(Source: JICA Survey Team)

Map 4-3: Location of the Study Points mammals along Transmission Line and Power Site (2-2)

Table 4-7: Main Birds identified in the proposed Transmission Line construction area

Sl. No.	Scientific Name	Common name	IUCN Status
1	*Dicrurus leucophaeus*	Ashy Drongo	LC
2	*Rubigula flaviventris*	Black crested Bulbul	LC
3	*Psilopogon asiaticus*	Blue throated Barbet	LC
4	*Acridotheres tristis*	Common Myna	LC
5	*Spilomis cheela*	Crested Serpent Eagle	LC
6	*Dendrocitta formosae*	Grey Treepie	LC
7	*Ardea intermedia*	Intermediate Egret	LC
8	*Argya striata*	Jungle Babbler	LC
9	*Microcarbo niger*	Little cormorant	LC
10	*Lanius schach*	Long tailed shrike	LC
11	*Pavo cristatus*	Peafowl	LC
12	*Cinnyris asiaticus*	Purple Sundbird	LC
13	*Pseudibis papillosa*	Red naped Ibis	LC
14	*Pycnonotus cafer*	Red vented Bulbul	LC
15	*Psittacula krameri*	Rose ringed Parakeet	LC
16	*Urocissa flavirostris*	Yellow billed Blue Magpie	LC

Note; LC=Least Concern (Source: Tashichholing Range Office)

(Source: JICA Survey Team)

Map 4-4: Location of the Study Points Birds along Transmission Line and Power Site

During the dry season survey, no reptiles or amphibians were encountered and/or sighted. The colder temperature and reduced activity levels of reptiles and amphibians during the winter months most likely contributed to absence of their sightings. However, rainy season survey recorded only 1 amphibian and 1 reptile species. Both the species are not listed in the IUCN.

During the rainy season survey, also 26 species of Insects and Butterflies were recorded which 4 species were listed as LC in the IUCN.

Table 4-8: Herpetofauna identified in the proposed Transmission Line construction

Sl. No.	Scientific Name	Common name	IUCN Status
1	*Bufo bufo*	Common Toad	-
2	*Ptyas sp*	Rat snake	-

(Source: Tashichholing Range Office)

Table 4-9: Insects & Butterflies identified in the proposed Transmission Line construction area

Sl. No.	Scientific Name	Common name	IUCN Status
1	*Zemeros flegyas*	Punchinello	-
2	*Aristocypha cuneata*	Blue-wedge Jewel	-
3	*Athyma perius*	Common sergeant butterfly	-
4	*Bombus sp*	Bumblebee	-
5	*Calliphora sp*	Blow fly	-
6	*Cirrochroa aoris*	Large Yeoman	-
7	*Coccinella sp*	Lady bird	-
8	*Delias pasithoe*	Red-base jezebel	-
9	*Diplacoides trivalis female*	Chalky percher	-
10	*Diplacoides trivalis male*	Chalky percher	-
11	*Eurema hecabe*	Common Grass-yellow	LC
12	*Euthalia sahadeva*	Green Duke	-
13	*Neptis hylas*	Common Sailer	-
14	*Neurobasis chinensis*	Common Green Metalwing	LC
15	*Orthetrum pruinosum female*	Crimson-tailed Marsh Hawk	LC
16	*Orthetrum pruinosum male*	Crimson-tailed Marsh Hawk	LC
17	*Papilio polytes*	Commom Mormon	-
18	*Papilio nephelus*	Yellow Helen	-
19	*Papillio paris*	Paris Peacock	-
20	*Pieris brassicae*	Large Cabbage White	-
21	*Pieris canidia*	Indian Cabbage White	-
22	*Pseudozizeeria maha*	Pale Grass Blue	-
23	*Symbrenthia sp*	Jester	-
24	*Tetraponera rufonigra*	-	-
25	*Tirumala septentrionis*	Dark Blue Tiger	-
26	*Ypthima baldus*	Common five ring	-

Note; LC=Least Concern (Source: Tashichholing Range Office)

ii. Dry Season

Animal habitat surveys were conducted during the dry season, 9 days from 10th to 18th, January 2024, and 62 species of birds, 7 species of mammals were found in and around the proposed transmission line area. However, not a single specimen of herpetofauna were observed. The colder temperature and reduced activity levels of reptiles and amphibians during the winter months most likely contributed to absence of their sightings. (See Appendix-4 on the list of Birds)

Among the confirmed bird species, which all fall under least concern and not listed category of IUCN redlist, and among mammals, the Asian elephant (EN) was confirmed to live in the area.

Table 4-10: Mammals identified in the proposed Transmission Line construction area

Sl. No.	Scientific Name	Common Name	IUCN Status
1	*Muntiacus muntjak*	Barking deer	LC
2	*Sus scrofa*	Wild Boar	LC
3	*Hystrix indica*	Indian crested porcupine	LC
4	*Prionailurus bengalensis*	Leopard cat	LC
5	*Elephas maximus*	Asian elephant	EN
6	*Martes flavigula*	Yellow-throated marten	LC
7	*Ratufa bicolor*	Malayan giant squirrel	NT

Note; EN=Endangered, LC=Least Concern, NT=Near Threatened (Source: JICA Survey Team)

3) Evaluation on "projects must not involve significant conversion or significant degradation of critical habitats and critical forests"

This project does not involve significant conversion or significant degradation of critical habitats and critical forests but Asian elephant designated as Endangered (EN) and Common Leopard Malayan Giant as Vulnerable (VU) listed in the IUCN Red List was discovered in the site, but no other individual was not confirmed during the survey, so it is presumed that it is not an important habitat.

Considerations shown in the table below is planned to be taken into account to ensure that "projects must not involve significant conversion or significant degradation of critical habitats and critical forests".

Table 4-11: Actions on consideration taken to avoid significant degradation of critical habitats

No.	Considerations required by JICA GL	Actions on Consideration taken by Project
(1)	Projects shall not exert significant adverse impacts on biodiversity values existing in "critical habitats" and key functions of the ecosystems:	The endangered species that have been confirmed to live are widely distributed in and out of the project area, and the project area is not an important habitat. No impact on foraging and breeding grounds is envisaged.
(2)	Over a reasonable period of time, projects shall not cause net reduction in endangered species population listed below: Species classified into "Critically Endangered (CR)" and "Endangered (EN)" out of "Threatened" species listed on the IUCN Red List of Threatened Species, or those that fall under such classifications in accordance with the host country's rules and regulations.	"Endangered (EN)" and "Vulnerable (VU) out of "Threatened" species listed on the IUCN Red List of Threatened Species was confirmed at the site. If the accidentally breeding behavior of these species in the project sites is confirmed during construction phase, plans which minimize adverse impact by not doing construction work at night, by covering up the construction site with covers, and using low-noise heavy machine is to be selected not to cause net reduction in endangered species population.

(3)	Long-term and effective mitigation measures and monitoring shall be put in place be performed with regard to (1) and (2) above.	Available mitigation measures, securing a traditional migration route or establishment a new one (beast path) not to divide home ranges of species are to be adopted by contractor. The number of individual of species and behavior of animals is planned to be monitored at any time during construction phase.

Table 4-12: Status of considerations of transmission line site

No.	Considerations required by JICA GL	Status of considerations of Project site
(1)	Habitat of significant importance to Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Near Threatened (NT) species, as listed in the IUCN (International Union for Conservation of Nature) Red List of threatened species or equivalent national approaches;	The threatened species designated as Endangered (EN), Vulnerable (VU) and Near Threatened (NT) that have been confirmed to live are widely distributed in and out of the project area, and the project area is not an important habitat. No impact on foraging and breeding grounds is envisaged.
(2)	Habitat of significant importance to endemic or restricted-range species;	The project site does not involve a habitat of significant importance to endemic or restricted-range species;
(3)	Habitat supporting globally or nationally significant concentrations of migratory or congregatory species;	The project site does not involve a habitat supporting globally or nationally significant concentrations of migratory or congregatory species;
(4)	Highly threatened or unique ecosystems;	The project site does not involve a highly threatened or unique ecosystems;
(5)	Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (1) to (4).	The project site does not involve Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (1) to (4).

4.2 Socio-economic conditions

4.2.1 Dzongkhag Profile

Samtse Dzongkhag is situated in the southern-western part of Bhutan, sharing borders with the Indian states of West Bengal and Sikkim. It covers an area of approximately 1309.1 square kilometers. Samtse experiences a subtropical monsoon climate, with elevations ranging from 600 to 800 meters above sea level. This climate is conducive to the cultivation of various cash crops which include areca nut, ginger, orange, and cardamom. These crops are primarily exported to neighboring countries such as India and Bangladesh.

According to the Population and Housing Census of Bhutan 2017 (PHCB 2017), Samtse had a population of 62,590. Approximately 48.8% of the population is female, and the majority of the population resides in rural areas, accounting for 84.5% (52,916) of the total population. The literacy

rate in Samtse is reported to be 63.9%, which is below the national literacy[1] rate of 71.4%. There is a notable disparity in literacy levels between males (70.9%) and females (56.5%), with males having higher literacy rates.

4.2.2 Communities along proposed transmission line

Tendu Gewog

Tendu Gewog is situated approximately 69 kilometers northwest of Samtse Dzongkhag and covers an area of 132.52 square kilometers. The population of Tendu was 6,242 with approximately 48.5% female population (PHCB 2017). Tendu falls in the sub-tropical zone with warm summer and cold winter with snowfall in the northern regions of the Gewog. The economy of Tendu Gewog is predominantly agricultural and pastoral. A large majority of the population is engaged in agricultural and livestock farming. Paddy, cardamom, and oranges are mentioned as the main food and cash crops cultivated in the region. The gewog has access to basic health and education facilities.

Tashichhoeling Gewog

Tashichhoeling is where the Dungkhag Headquarters is located. Covering an area of 27.67 km^2, the gewog is located to the west of Samtse. The population of Tashichhoeling is 4,577, with a female population of comprising of 2,259. With altitudes ranging from 400 to 1400 meters above sea level, the gewog experiences hot and humid summer and pleasant winters. The gewog has access to several essential facilities, including a Primary Health Care centre, an Outreach Clinic (ORC), a primary school, and a high school. This indicates a level of development in terms of healthcare and education infrastructure within the gewog. Currently, there is also a 20-bedded hospital under construction for servicing the gewogs under the Dungkhag.

Pemaling Gewog

Pemaling, is located about 50.6 km west of Samtse, covering an area of 49.04 km^2. The population of Pemaling is 3,262 of which 1,570 are females. The climate of the gewog varies from the north to the south – from cool temperature to sub-tropical type of climate. Most of the people in Pemaling are engaged in agricultural and livestock farming. The gewog has a BHU, three ORCs, two primary schools, two ECRs and 4 ECCDs.

4.2.3 Population

The table below shows the population, area, and population density of the gewogs where the power plant and transmission line projects are located. The number of people per household where the project is located, varies from 2.1 to 2.4, and the population density varies from 24.3 to 35.4 persons/km^2.

[1] Literacy is defined as the ability to read and write a short text in Dzongkha, *Lotsham*, English or any other language.

Table 4-13: Population of Affected Gewogs

Gewog	Population	No. of HHs	Average family member per HH	Area (km²)	Population Density (persons/km²)
Tendu	3216	1347	2.4	132.52	24.3
Pemaling	1692	724	2.3	49.04	34.5
Tashichhoeling	2018	980	2.1	27.67	35.4

(Source: National Statistics Bureau of Bhutan "2017 Population &Housing Census of Bhutan Samtse Dzongkhag", Area size is URL: http://www.samtse.gov.bt/gewogs, accessed on December 18 2023)

Note: Average number of persons per household is calculated from the number of households and families living in a normal house.

The table below gives a chiwog wise breakdown of the population in the impacted gewogs by the Transmission Line.

Table 4-14: Population of Chiwogs

Gewog	Chiwog	POPULATION		
		Male	Female	Total
Tendu	Miglamthang_Thagpzosa	521	466	987
	Dawathang_Kingaling	464	441	905
	Khengtong_Targothang	222	192	441
	Kachhen_Kuchhen	519	480	414
	Nyizergang_Tendruk	1490	1447	2937
Pemaling	Chhusilgang_Dramedsa	517	513	1030
	Dizang-gang_Nakeyling	328	260	588
	Manigang_Tashithang	280	258	538
	Norgeyling_Shindregang	294	282	576
Tashichhoeling	Tashichhoeling	240	234	474
	Daangling_Gangjoog	238	227	465
	Dewachen_Zhiwaling	211	197	408
	Norjangsa_Peljorling	391	403	794
	Baepoetng_Kangdoongphu	1819	938	881

(Source: National Statistics Bureau of Bhutan "2017 Population &Housing Census of Bhutan Samtse Dzongkhag")

4.2.4 Project Affected People (PAP)

The total land area covered by the proposed 14km PTL with 18m RoW is estimated to be **62.3 acres.** However, the actual area required for the tower base for whole line length will be less and is expected to be **0.864 acres (i.e., avg. tower base area 0.018 acres × 48 towers).** Out of which only **0.054 acres** of private land will be directly affected by tower base installation.

The following tables shows the details of tower locations and Projected Affected People (PAP) of the proposed project:

Table 4-15: Land type and Land use type of tower locations

SN	Village Name	Tower Number	Land Type (SRFL / Pvt. Land)	Land Use Type
1	Bindukhola (Power House)	AP-00	SRFL	State Reserve Forest
2	Borlane	AP-1 to AP-4		
3	Selwithang	AP-5 and AP-6		
4	Dawathang	AP-7 and AP-8		
5	Kuengaling	AP-9 and AP-10		
6	Nunpani	AP-11		
7	Kuengaling	AP-12	**Pvt. Land**	**Kamzhing**
8		AP-13 and AP-14	SRFL	State Reserve Forest
9	Goiri Kholtsha	AP-15		
10	Yurungthang	AP-16 and AP-17		
11		AP-18	**Pvt. Land**	**Chhuzhing**
12	Thangchena	AP-19 and AP-20	SRFL	State Reserve Forest
13	Ramdale	AP-21		
14	Lapsechok	AP-22		
15	Gophadangra	AP-23 and AP-24		
16	Laptsechok	AP-25		
17	Semal Dangra	AP-26 and AP-27		
18	Suthrupe	AP-28 to AP-40		
19	Chekshing	AP-41		
20	Jogimara	AP-42, AP-44 to AP-46		
21		AP-43	**Pvt. Land**	**Kamzhing**
22	Jogimara Substation	AP-47	SRFL	State Reserve Forest

Table 4-16: Details of Project Affected People by the tower installation of 66kV Druk Bindu TL

SN.	Name of the Affected People	CID	Affected Tower Location no.	PlotID	Thram no	Village/Gewog	Type of Land	Land Area Affected (Acres)
1	Tara Man Gurung	11214001868	AP-43	SIP-4974	212	Trashichhoeling	Kamzhing	**0.018**
2	Sey Dema	11202000381	AP-18	BIR-2725	485	Pemaling	Chhuzhing	**0.018**
3	Mumta Rai	11202002102	AP-12	TEN-4428	1254	Tendruk	Kamzhing	**0.018**
					Total Pvt. Land Affected			**0.054 Acres**

Table 4-17: Details of Private land falling within the 18m RoW of the 66kV Druk Bindu TL

SN	PlotID	Gewog	Thram_No	Land Owner	CID	Land_Type	Land Impacted (Acres)
1	TEN-4435	Tendruk	1255	Lal Bahadur Rai	11216002529	Kamzhing	0.119
2	TEN-4224	Tendruk	1189	Pathar Man Rai	11216001061	Cardamom	0.078
3	TEN-262	Tendruk	52	Lal Bahadur Subba	11216002843	Oranges	0.185
4	TEN-2371	Tendruk	478	Durga Maya Gurungni	11216002590	Kamzhing	0.035
5	TEN-4428	Tendruk	1254	Mumta Rai	11202002102	Kamzhing	0.073
6	TEN-2137	Tendruk	449	Kabi Raj Rai	11216004893	Kamzhing	0.086
7	TEN-2090	Tendruk	446	Chandra Man Rai	11216001060	Cardamom	0.100
8	TEN-1997	Tendruk	437	Maher Man Rai	11216001004	Kamzhing	0.306
9	TEN-261	Tendruk	52	Lal Bahadur Subba	11216002843	Oranges	0.015
10	TEN-5778	Tendruk	1672	Chatra Man Rai	11216005052	Kamzhing	0.067
11	TEN-1637	Tendruk	421	Kantu Doj Rai	11216004915	Kamzhing	0.000
12	BIR-3060	Pemaling	599	Pema Delma	11202003327	Kamzhing	0.021
13	BIR-5537	Pemaling	1305	Raj Maya Rai	11202002152	Oranges	0.071
14	BIR-2753	Pemaling	490	Tenday Zangmo	11202000376	Kamzhing	0.079
15	BIR-1416	Pemaling	261	Lachi Maya Rai	11202002149	Kamzhing	0.057
16	BIR-4610	Pemaling	1087	Namgyel Dorji	11009001771	Kamzhing	0.247
17	BIR-2912	Pemaling	1518	Dawa Zangmo	11806001426	Kamzhing	0.227

18	BIR-2725	Pemaling	485	Sey Dema	11202000381	Chhuzhing	0.078
19	BIR-5560	Pemaling	471	Bir Bdr. Rai	11202002096	Oranges	0.004
20	BIR-5538	Pemaling	1306	Santosh Rai	11202002151	Oranges	0.076
21	SIP-904	Trashichhoeling	344	Geeta Raj Gurung	11214001172	Oranges	0.345
22	SIP-724	Trashichhoeling	654	Devi Rai	11216001629	Oranges	0.167
23	SIP-1223	Trashichhoeling	469	Sangay Dorji	11214000226	Chhuzhing	0.005
24	SIP-1225	Trashichhoeling	469	Sangay Dorji	11214000226	Kamzhing	0.005
25	SIP-4554	Trashichhoeling	1344	Choni Rangshar Rimpoche	10102003339	Kamzhing	0.097
26	SIP-4975	Trashichhoeling	212	Tara Man Gurung	11214001868	Kamzhing	0.065
27	SIP-4974	Trashichhoeling	212	Tara Man Gurung	11214001868	Kamzhing	0.192
28	SIP-1533	Trashichhoeling	533	Tandin Buda	11214000159	Kamzhing	0.019
	TOTAL Pvt. Land Impacted by RoW (Acres)						**2.819**

5 ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT

The assessment of environmental impacts and proposed mitigation measures during construction and operations phases are presented in the following sections

5.1 Summary of Impact Assessment of the Proposed Project

As result of baseline survey, impact items and result are summarized as table in the below.
Following section from 5-2 to 5-4 will further explained on impact assessment of each item with additional survey results.

Table 5-1: Summary of Potential Impacts of the Proposed Project

Item	Impact item		Rating (Scoping)		Rating (After Study)		Results
			Pre/ construction phase	Operation phase	Pre/ construction phase	Operation phase	
Pollution Control	1	Air Quality	レ	レ	B-	D	**Construction phase:** Dust is foreseen to be generated during civil engineering works such as land development, but the impact will be temporary. In addition, air pollutants (SOX, NOX, etc.) may be emitted by heavy equipment and trucks, but the area of impact associated with emissions will be limited to the vicinity of the construction area. **Operation phase:** No air pollution will occur.
	2	Water Quality	レ	レ	D	D	**Construction phase:** Since there are no plans to construct towers in the river channel, the impact is expected to be minor. In addition, water pollution from chemicals is not expected as there are no plans to use ground improvement chemicals in the construction of the towers. Wastewater will be generated from construction of access road. and if it is not properly treated without using sedimentation tank to purify waste water at the site, it is expected to have an impact. There is no concern about water pollution from domestic wastewater and rainwater from employee camps, as this water is to be drained after being purified in purification facility. **Operation phase:** No Water pollution occurs as the slope is covered with vegetation.
	3	Waste	レ	-	B-	D	**Construction phase:** General and hazardous waste is generated during construction. **Operation phase:** No waste is generated.

Item	Impact item		Rating (Scoping)		Rating (After Study)		Results
			Pre/ construction phase	Operation phase	Pre/ construction phase	Operation phase	
	4	Soil Quality	✓	-	B-	D	**Construction phase:** Possible soil contamination due to leakage of lubricating oil and fuel oil from construction vehicles, construction equipment, etc. **Operation phase:** No soil contamination occurs because no work involving construction.
	5	Noise and Vibration	✓	-	B-	D	**Construction phase:** Noise and vibration impact is expected due to the operation of heavy machinery and trucks, but the impact area is limited to the vicinity of the construction area. **Operation phase:** No noise or vibration is generated.
	6	Subsidence	-	-	D	D	**Construction phase and Operation phase:** No particular impact is expected as no groundwater pumping.
	7	Odor	-	-	D	D	**Construction phase and Operation phase:** Education on the management of waste disposal facilities and waste handling will be thorough, so no impact is expected.
	8	Sediment	-	-	D	D	**Construction phase and Operation phase:** No particular impact is expected since there is no continuous drainage to rivers, etc.
Natural Environment	9	Protected Areas	-	✓	D	D	**Construction phase and Operation phase:** Jigme khesar Strict Nature Reserve under the Environmental Protection Act of Bhutan is located approximately 25km north of the site. The impact to the users of protected area for ecotourism is not estimated as the site of project is far from ecotourism area of protected area.
	10	Biodiversity	✓	✓	B-	B-	**Construction phase:** The construction activities are expected to affect the terrestrial ecosystem due to tree cutting, air pollution, noise, and vibration generated by the construction activities. **Operation phase:** Impacts from migratory behavior of large mammals, bird strikes, etc. are expected.
	11	Hydrology	-	-	D	D	**Construction phase and Operation phase:** No particular impact is expected since the project does not involve any construction work on the water vein.
	12	Topography and Geology	-	-	D	D	**Construction phase and Operation phase:** No significant topographic change is expected, so no particular impact is anticipated.
Social Environment	13	Land acquisition and Resettlement	✓	-	B-	N/A	**Pre-construction**: As a result of field survey and hearing from local government and residents, 0.05 acres private land acquisition of 3 HHs are planned. No local residents live in the project site, thus residential resettlement is not required. **Operation phase:** No additional resettlement or land acquisition is anticipated.

Item	Impact item		Rating (Scoping)		Rating (After Study)		Results
			Pre/ construction phase	Operation phase	Pre/ construction phase	Operation phase	
	14	Socially Vulnerable Groups	✓	✓	D	D	As a result of field survey and hearing from local government and residents, no socially vulnerable groups (the poor, disability, hhs without civil registration, etc.) are identified among project affected persons.
	15	Ethnic Minorities and Indigenous Peoples	✓	✓	D	D	As a result of field survey and hearing from local government and residents, no indigenous peoples are confirmed in the project site.
	16	Local economy, including employment and means of livelihood	✓	✓	B+/-	B+	**Pre-Construction Phase:** Cardamon and orchard products will be lost by permanent land acquisition. **Construction phase**: Employment opportunities arise as construction workers. **Operation phase:** Local residents could be employed to assist in the operation and maintenance of the transmission line.
	17	Land use and local resource use	✓	✓	D	D	As a result of field survey and hearing from local government and residents, it is predicted that no impact on livelihood of local people.
	18	Existing social infrastructure and social services	✓	✓	B-	B+	**Construction phase**: Traffic volume of trucks is predicted to be increased during the construction. **Operation phase**: No impacts are predicted since there are no public facilities or private houses within near transmission line.
	19	Labor Environment	✓	✓	B-	D	**Construction phase**: A number of workers will be temporarily staying at the construction site, accordingly, appropriate considerations are required to be planned and implemented in terms of employment conditions and safety for various workers, including domestic and foreign workers, gender-wise considerations, etc. **Operation phase:** BPC is required to manage their staff in charge of transmission line in accordance with the Labour and Employment Act 2007 and also the Occupational Safety and Health Policy (OSPH).
	20	Sanitation, Safety and security in local society	✓	-	B-	N/A	**Construction phase**: The inflow of many workers at the construction site may result in infectious disease outbreaks, deterioration of public safety, etc.
	21	Cultural heritage	✓	✓	D	D	According to GIS data of cultural heritage information and also hearing from the local government and residents, there will be no impacts on local historical, cultural, or archaeological properties, land features near the transmission line.

Item		Impact item	Rating (Scoping)		Rating (After Study)		Results
			Pre/ construction phase	Operation phase	Pre/ construction phase	Operation phase	
	22	Scenery	✓	✓	D	D	As a result of hearing from the local government and residents, the potential for negative impacts on the landscape is not confirmed.
	23	Gender	✓	✓	D	D	As a result of hearing from the local government and residents, implementing agency, any particular gender-wise considerations are not confirmed.
Other	24	Accident	✓	✓	B-	B-	**Construction phase**: There is a possibility of accidents due to construction activities. Also, traffic accidents can be happened due to increased traffic. **Operation phase**: Accident may occur during operation and maintenance work of transmission power and line.
	25	Transboundary impacts, and climate change	-	-	D	D	Transmission lines do not cross the border. In addition, no CO_2 is generated.
	26	Electromagnetic Fields	-	-	D	B-	**Construction Phase:** No Electromagnetic Fields (EMFs)is generated. **Operation Phase:** Electromagnetic Fields (EMFs)is generated which arise from the utilization of electrical power and various natural and human-made lighting sources.

レ : Impact is expected or unknown (further examination is needed, and the impact may be clarified as the study progresses)
— : No impact is expected.
A+/- : Significant positive/negative impact is expected.
B+/- : Positive/negative impact is expected to some extent.
C : Extent of positive/negative impact is unknown (further examination is needed, and the impact may be clarified as the study progresses).
D : No impact is expected.
N/A : Impact assessment was not performed due to a D in the scoping phase.

(Source: JICA Survey Team)

5.2 Environment Impacts

5.2.1 Environmental Impacts during Pre-construction Phase

During pre-construction period, not so many impacts are foreseen and preparatory work for starting project implementation would have some impacts. Except for field surveys, public consultations, and material procurements there are no pre-construction activities involving damage or disturbance to natural environment.

Table 5-2: Environmental Impacts during Pre-Construction Phase

Env. Quality component	Impacts
Air Quality	- Air pollutant emissions resulting from pre-construction activities such as route selection surveys, geotechnical investigation, and material procurements are anticipated to occur, but their impact is expected to be negligible.
Noise and vibration	- Noise and vibration caused by the implementation of pre-construction activities such as route selection surveys, geotechnical investigation, and material procurements are anticipated to occur, but their impact is expected to be negligible.

5.2.2 Environmental Impacts during Construction Phase

The erection of towers, installation of high-tension cables, and the construction of access roads, particularly in forested regions where many transmission towers are situated, necessitates construction of access roads & rope ways for transporting construction materials. This process involves clearing vegetation, excavating along steep slopes, blasting in rocky terrain, and depositing excavated material at excavation sites. Therefore, the likely environmental impacts of these activities are detailed in the table below.

Table 5-3: Impacts during Construction Phase

Env. Quality component	Impacts
Air Quality	- Dust is expected to arise during civil engineering activities like land development and access road construction, but its effect is temporary. Moreover, emissions from heavy machinery and trucks may occur, yet their impact is confined primarily to the construction site's vicinity.
Noise and vibration	- Anticipated noise and vibration effects stem from the operation of heavy machinery, trucks, and access road construction. However, these impacts are localized primarily within the vicinity of the construction area. Additionally, heightened human activity in the vicinity could contribute to noise levels.
Odor	- Generation of odor due to improper waste management is expected.
	-
Soil Quality	- Removal and exposure of topsoil leading to erosion from wind and rain; - The project is expected to produce approximately **57,246 m³** of excavated soil,

	mainly from benching and foundation activities for tower footing. Concerns include potential slope instability and obstruction of drainage paths due to excavated materials. However, the impact is projected to be minimal as over 95% of the excavated soil will be reused in backfilling for tower footing reinforcement. Additionally, most tower locations are positioned remotely from water bodies, mitigating the risk of significant soil runoff into rivers. Therefore, the environmental impact of excavation work is site-specific and temporary. - Possible soil contamination due to leakage of lubricating oil and fuel oil from vehicles, machinery and equipment maintenance.
Waste	- The proposed TL project is expected to generate a total of approximately 10,175 cubic meters of excavated soil, primarily from foundation activities for tower footing as shown in the table below. - Concerns regarding excavation work include potential slope instability and obstruction of drainage paths due to the excavated materials. However, the overall impact is projected to be minimal, with over 95% of the excavated soil earmarked for reuse in backfilling to fortify the tower footing. Moreover, the risk of significant soil runoff into rivers is mitigated by the remote positioning of most tower locations, away from water bodies. - Thus, the environmental impact of excavation work is site-specific and temporary. - The increase in solid waste is attributed to the various construction activities and the influx of workers to the project sites. During the construction phase, a range of waste types is expected to be generated, including empty cement bags, construction debris like aggregate, sand, cement, metal rods, and damaged tower parts. - Moreover, the larger workforce presence indicates the potential for additional waste types such as food and packaging materials at labor camps. According to national waste data, the average individual generates approximately 0.23 kg of waste per day. Therefore, each camp is projected to produce a total estimated residential solid waste of 4.6 kg per day (0.23 x 20 workers in each camp) or less, considering their remote location. - Littering and open-air dumping have the potential to contaminate the soil, while improper disposal of waste materials may also result in odors.
Protected Area	- Loss of outstanding landscapes of protected area is to be afraid due to towers.
Biodiversity	- Construction activities, particularly the development of access roads, involve the clearance of vegetation, resulting in habitat loss and fragmentation for wildlife. - Moreover, the operation of heavy machinery and deep excavation near tower locations can introduce air pollution and noise, potentially impacting the animals residing within the site. - Furthermore, disturbances to wildlife and their habitat are expected from activities such as blasting, rolling rocks, and burial of vegetation under excavated soil alongside the access road.

	- There is also a notable risk of birds colliding with power lines installed during construction.
	- Construction activities, including the creation of access roads, can significantly impact vegetation. This involves the cutting or removal of all vegetation, including trees, with an estimated total of 39,273 trees to be cut for access road construction, ropeway installation, and right-of-way clearing for transmission line activities. However, due to the deep valley crossings along the transmission line route, clearing a 27m RoW for the entire route is not required. Instead, for valley crossings, a 4m ROW clearance for conductor spanning is deemed sufficient. Additionally, an 80% removal rate is considered, recognizing that many electric lines will traverse deep ravines and valleys where vegetation removal may not be as extensive as initially estimated.
Poaching Threats	- The remote tower locations and labor camps, situated far from towns, face a significant threat of poaching due to the large number of workers gathering in these areas. The lack of easy access to meat increases the temptation for poachers. Additionally, the scattered nature of labor camps along the TL route through the jungle presents a challenge for Forest Officials to maintain constant vigilance. However, the heightened risk is deemed temporary and manageable through measures such as increased awareness, clear guidelines for workers, and consistent monitoring by both contractors and the BPC.

Table 5-4: Estimates volume of Excavated soil from the Tower foundation of 66kV TL

Tower Type	**B**	**C**	**D**	**SP**
Foundation width **(m)** of one Leg of a Tower	4	4.3	5.6	7.3
Depth of Foundation/Height **(m)**	3.05	3.05	3.05	3.05
Total Foundation Area **(width × width) × 4 legs (m^2)**	64	73.96	125.4	213.16
Volume of Excavated Soil **(Area × Height) (m^3)**	195.2	225.578	382.6	650.138
No. of Tower Type to be used from (48 TOWERS)	37	8	3	0
Total Volume of Excavated Soil (m^3)	**7222.4**	**1804.624**	**1147.8**	**0**
Total Excavated Soil from The Project (m^3)	**10, 175**			

Table 5-5: Tree Density of the forest on the Right-of-Way (RoW) of the Transmission line

					Density		Volume	
	Area per plot m²	**No of plots**	**Total plot area m²**	**Total number of trees**	**Per M2**	**Per Hac**	**Total Volume all plots (cft)**	**Volume per tree (cf)**
JMTL	225	24	5400	285	**0.053**	527.78	17666.02	61.99

Table 5-6: Tree removal estimates from the Right-of-Way (RoW) clearing of the Transmission line

Tower no.	**Elevation (m)**	**Place Name**	**SPAN_m**	**Span covering Land Type (m)**	**Row**	**Area m²**	**Remarks/Land Types**	**Estimated no. of Trees (×0.053)**
AP-00	757	Druk Bindu Powerhouse: Borale, Tendu			18	0		0
AP-1	843	Borlane, Tendu	353	353	18	6346.036		336
AP-2	858		276	276	18	4964.184		263
AP-3	870		188	188	18	3380.6		179
AP-4	826	Selwithang, Tendu	401	401	18	7219.025		383
AP-5	812		695	695	4	2778.829	Deep valley Crossing + River	147
AP-6	875		168	168	18	3025.072		160
AP-7	903	Dawathang, Tenduk	249	249	18	4474.507		237
AP-8	893		233	233	18	4200.635		223
AP-9	846	Kuengaling, Tendu	555	555	4	2220.041	Deep valley crossings	118
AP-10	809		261	261	18	4703.985	Community Forest	249
AP-11	777	Nunpani, Tendu	289	289	4	1157.502	Valley crossing	61
AP-12	807	Kuengalig, Tendu	466	466	4	1862.434	Valley crossing	99
AP-13	794		246	246	18	4426.457		235
AP-14	784		271	271	18	4883.505		259
AP-15	752	Goiri Kholtsha, Pemaling	745	745	4	2981.724	Deep valley crossing + river	158

AP-16	739	Yurungthang, Pemaling	290	290	4	1159.273	Valley crossing	61
AP-17	718		364	364	18	6558.059		348
AP-18	707		172	172	18	3099.842		164
AP-19	675	Thangchena, Pemaling	646	646	4	2583.026	Valley crossing	137
AP-20	664		257	257	18	4619.697	Community Forest	245
AP21	591	Ramdale, Tashichholing	749	749	4	2995.383	CF + Deep valley crossing + River	159
AP-22	515	Lapsechok, Tashichholing	450	450	4	1798.858	valley crossing	95
AP-23	515	Gophadangra, Tashichholing	470	470	18	8453.881		448
AP-24	508		146	146	18	2630.44		139
AP-25	476	Laptsechok, Tashichholing	164	164	18	2953.54		157
AP-26	496	Semal Dangra, Tashichholing	167	167	18	3009.898		160
AP-27	497	Semal Dangra, Tashichholing	48	48	18	862.0253		46
AP-28	430	Semal Jue, Tashichholing	312	312	18	5616.689		298
AP-29	362	Suthrupe, Trashichholing	606	606	0	0	River crossing + Barren land	0
AP-30	360		306	306	0	0	Barren land	0
AP-31	383		215	215	0	0	Barren land	0
AP-32	402		207	207	18	3718.811		197
AP-33	361		175	175	18	3146.031		167
AP-34	426		180	180	18	3238.383		172
AP-35	408		135	135	18	2423.121		128
AP-36	374		231	231	18	4163.27		221
AP-37	360		307	307	18	5531.246		293
AP-38	349		188	188	18	3389.826		180
AP-39	343		221	221	18	3986.489		211
AP-40	350		217	217	18	3911.018		207

AP-41	323	Chekshing, Tshichholing	273	273	18	4913.193		260
AP-42	326	Jogimara, Tashishholing	331	331	0	0	Barren land	0
AP-43	353		176	176	0	0	Barren land	0
AP-44	353		195	195	0	0	Private Barren Land	0
AP-45	353		197	197	0	0	Barren Land-Built up areas	0
AP-46	344		236	236	0	0	Barren Land-Built up areas	0
AP-47	346	Existing Substation 66/33kV, Jogimara	96	96	0	0	Barren Land-Built up areas	0
		Estimated Total No. Trees to be cut for the DBTL Ptoject						**7,599**

5.2.3 Environmental Impacts during Operation Phase

It is expected that most of the assessed impacts are taken care of during the period of construction activities. However, considering that the project infrastructure and associated operations and maintenance activities will take place during the operational phase, there would be likely impacts if appropriate mitigation measures are not undertaken. Likely environmental impacts during operational phase are given in the table below;

Table 5-7: Impacts during Operation phase

Env. Quality Component	Likely impacts
Biodiversity	‣ Inhibition of the migration pathways of large mammals such as elephants by newly build towers ‣ Collision and electrocution of birds: Electric lines coming in the way of flight paths may lead to commission and electrocution of high-flying birds especially the near threatened Great Hornbills.
Electromagnetic Fields (EMFs)	‣ Electric and magnetic fields (EMFs) represent invisible energy waves, sometimes termed as radiation, which arise from the utilization of electrical power and various natural and human-made lighting sources.

5.2.1 Impacts during Construction Phase

(1) Influx of foreign workers

The contractor is likely to hire a higher number of foreign workers during the construction phase, particularly skilled and experienced individuals needed for tasks like foundation works, tower installation, and stringing. It is estimated that there will be approximately 20 workers in each camp during this period. Therefore, several associated issues must be addressed, including increased demand for housing, pressure on local water resources, risks of communicable diseases spreading in the area, waste management and sewerage challenges, occupational health and safety (OHS) concerns at work sites, potential conflicts with the local community, fire hazards at camp and work sites, alcoholism among workers, and the poaching/hunting of wild animals.

The majority of the labor camps will be situated at a distance from settlement areas, resulting in minimal interaction between foreign workers and local residents, thereby reducing potential social impacts. Negative impacts such as risk of spreading communicable diseases, waste management issues, and poaching will be successfully managed through meticulous planning and addressed within the Environmental Management and Monitoring Plan (EM&MP).

(2) Occupational Health and Safety (OHS)

Ensuring the health and safety of workers at construction sites is a significant concern during construction activities. Comprehensive Occupational Health and Safety (OHS) protocols are essential

throughout the construction period due to the persistent safety challenges faced by workers. The primary activities of foundation casting, tower installation, and stringing entail working in environments where risks abound, such as the danger of falling boulders during foundation works, working at considerable heights during tower installation and stringing, and the felling of trees to clear the Right of Way (RoW). Although the level of risk is elevated during construction, these impacts are typically temporary and can be effectively mitigated through the implementation of proper health and safety measures.

5.3 Social Impacts before and during construction

For assessing the impacts on the social environment, the survey team conducted interviews and discussions with Dzongkhag Administration Officials, Local Government functionaries during the month of November 2023. Gewog level public consultations, interviews with affected groups and local government functionaries were held in January 2024 and a National Stakeholder meeting was organized in February 2024 for seeking comments and feedback. A project affected population survey was conducted from the 20th February to 2nd March 2024. Additional interviews with the Tshogpas of affected chiwogs were held. The objective of the survey was to identify the project affected persons (PAPs) and take stock of the socio-economic situation of the affected households, the nature and level of impacts and identifying the level of vulnerability that exists among the population.

Using structured questionnaire and trained enumerators ensured consistency and reliability in data collection. Pre-appointments were made with affected households through the local representatives and all households available for survey during the period were surveyed. Cleaning, organizing, and analyzing the data in Excel spreadsheets was a crucial step in making sense of the information gathered. It allowed for the identification of trends, patterns, and key findings that will inform the development of a Resettlement/ Land Acquisition Plan aimed at ensuring fair compensation for those affected. The Table below provides a snapshot of the Survey respondents:

Table 5-8: Number of Project Affected Households by Land Acquisition

	Total HH	Those affected by Tower	Those affected by ROW	Remarks
HHs affected	**28**	**3**	**28**	3 households are impacted by both Tower and RoW
HHs surveyed	**15**	**3**	**15**	3 households affected by tower is located in Tendu (1), Pemaling (1) and Tashichhoeling (1)
% Surveyed	**54**	**100**	**54**	

2 out of the 15 respondents were females and 2 out of the 15 respondent households are female headed households. 8 of the 15 respondents were illiterate and the other 7 had some degree of education either western or monastic.

5.3.1 Land Acquisition and Resettlement

Proper care has been taken during the preliminary walk-on surveys of the TL route to avoid settlement, private land, wetland, culturally significant sites and other properties to ensure minimum loss of properties and resources. Land acquisition can be of two types, temporary and permanent. Land acquired to set up labor camps and stores are temporary whereas, permanent land acquisition is required for tower construction and to clear the RoW along the Transmission alignment.

For the proposed 14km of PTL project, there are 48 towers to be constructed and only 3 numbers of towers fall in private land. Approximately **5.4 decimals** of land need to be acquired permanently from the 4 affected land owners, since each tower base occupies around **1.8 decimals** of land.

It is to be noted that in the case of Power Transmission Lines, the BPC does not have to acquire or pay lease payments to the Government for the land that is impacted by the Project. This is mainly, as per discussions with BPC officials from the Environment Section, to ensure that the BPC is able to keep it mandates of social service by keeping electricity costs at affordable prices.

The permanent land acquired by the project is minimal; hence, there will be no impact on the income of the individual households due to land acquisition. Also, as assessment of impacted land viz a viz total land holdings was carried out to determine if any of the affected households meet the threshold for being classified as "Adversely Affected Family(ies)" to determine if the additional safeguard measures under the Sustainable Hydro Power Policy 2020 area applicable. It was concluded that none of the affected population can be classified as Adversely Affected Family(ies) as none of the affected population lose more than 25% of their land nor their homestead. Similar assessment was carried out for RoW, although, not for permanent acquisition, to determine the degree of impact and it can be concluded that it does not have a significant impact.

All the 3 households affected by Land Acquisition for construction of Tower stand to lose only less than 1% of their total land holdings. All the 3 households responded that they would opt to go for a land replacement or realignment. Hence, based on the information it can be concluded that the acquisition will not have major bearing on their livelihood. Further during the survey, all 3 households confirmed that they do not reside in the affected land. The total land holdings of the PAPs are attached as Appendix-5.

Similarly, the RoW impacts the land of 28 households across the 3 gewogs. However, a comparison of their land holdings viz a viz the impacted land, 17 of the households are impacted on less than 1% of their total land holdings, 8 households less than 3% and 3 households less than 4%.

Considering, RoW implications are principally for infrastructure construction and all of the households are impacted on less than 4% of their landholdings, minimal impact on livelihood is expected.

5.3.2 Socially Vulnerable Groups

The respondents reported income of Nu. 110,000 and Nu. 15, 60,000 in the households. 8 of the respondents reported being illiterate, 2 had Lower Secondary Level schooling, 3 middle secondary education, 1 a Diploma and 1 having a University Degree. 13 households also reported having family members residing away and 8 household reported receiving remittances from them.

All respondents reported having access to piped drinking water connections, electricity and owning mobile phones and being connected to the road. 13 households reported living in their own permanent single storey cottages, 2 household reported living in 2 storied concrete permanent houses (1 owned the structure and 1 lived on rent). 8 respondents also reported owing their own means of transport.

For the purpose of this Assessment, as the respondent group are primarily farming households, to determine vulnerability on income is complex and unclear. Hence, in addition to income level, status of food insecurity, all female households, senior citizen households and households with disabled family members were used to determine if any of the respondents are considered socially vulnerable.

All households reported not facing food insecurity, and many reported as sharing their paddy harvest with their relatives who live outside of the Dzongkhag. All of the respondents interviewed were citizenship card holders.

None of the households interviewed were comprised of all females, or composed of only senior citizens (65 and above) and none of the respondents had family members who were Person (s) with Disability. All of the affected households interviewed were citizenship holders.

Based on these findings, it can be concluded that there are no socially vulnerable groups in the affected population.

5.3.3 Ethnic Minority and Indigenous Groups

Samtse is home to the group of ethnic group "Doyaps". During interviews with Dzongkhag and Gewog officials it was confirmed that there would be no impact on the Doyab Community as the project site is located well away from the area where the Doyaps reside (in other gewogs).

During the survey, the respondents were asked if the households identified either as a minority or indigenous group and all respondents confirmed the households do not belong to any specific group or consider themselves a minority. Further, they were also asked if they know or area aware of any minorities/ groups in the project area and their responses confirmed the absence of any minority or indigenous group, as stated by officials.

5.3.4 Local Economy, including employment and means of livelihood

11 out of the 15 respondents are engaged in farming for self-consumption and cash income and as their primary activity. 1 reported being employed in the civil service and 3 households being engaged in business activity. However, of the 11 households engaged in farming, 2 also reported also being engaged in livestock rearing, 3 reported also carrying out small business activities, 1 reported pension income as well.

The project will have some impact livelihood means as the impacted land is agriculture land. However, considering the acquisition component is only .18 acres of land from each of the 3 impacted households, and their total land holdings, the anticipated impact on livelihood is very low.

During Construction of the PTL, the areas under RoW might also cause some damages to crops and lead to the destruction of some trees (in orchards), however, these are minimized during construction and can only be determined during the actual construction and stringing of the lines. However, these damages are also assessed jointly with the relevant competent authority and compensated based on the rates prescribed by the Property Assessment Valuation and Agency (updated every three years). The latest rates from the Agency are the Compensation Rates 2022.

All of the respondents expressed hope and aspirations that the project would entail the opportunities for them to sell their agriculture produce, set up small businesses and also employment opportunities for the residents during time of construction and during the operational phase.

5.3.5 Land Use and Local Resource Use

The PTL RoW will also lead to the clearing of trees in the CF and a total area of 3.38 acres (2.41 acres in Pemaling and .97 in Tendu) of belonging to 2 Community Forest Groups will be acquired (1 under Pemaling Gewog and 1 under Tendu Gewog). The CF is based on user rights and it is stipulated under the regulations that the Government shall exercise right to implement and execute any developmental activity of national importance in the Community Forest. In the event the Community Forest is taken over by the government, a fair compensation determined by the Department may be paid to the Community Forest Management Group. This compensation is calculated based on a minimum royalty fee determined by the Department) for each tree cut in their community forest. A joint tree enumeration and verification is conducted by Forest officials, CF management, and BPC and concern contractor/s during the construction phase and paid by the BPC.

These Community Forests are primarily used for collection of Non-Wood Forest Products and the trees are used by the community members for meeting their building needs and other communal needs. However, considering that the affected are composes around 3% of the total CF area (57 acres in Pemaling and 50 acres in Pemaling), it can be concluded it will not have a major bearing on activities of the communities in accessing local resources from the forest. However, it should also be noted that foraging activities for non-wood forest products is not limited to only the CF, but the residents also

access other parts of state reserve forests to harvest these products under the rules and regulations of the Department of Forest and Park Services.

5.3.6 Water Use

Through interviews with local government officials and the Tshogpas of the affected chiwogs, it was validated that the project would not have any impact on water sources for drinking or irrigation. During the survey, all respondents confirmed that the project wouldn't impact any water sources. Further, it was also found that all of the respondents have piped water connection to their homes and enjoy access to safe drinking water.

5.3.7 Existing Social Infrastructure and Social Services

Both respondents expressed concerns over possible deterioration of existing roads and bridges due to the increased traffic for carrying out the project activities exert pressure on these resources. Similar concerns were also raised by the Gewog Officials.

The DGPC has already initiated capacity studies of the existing road network and bridges with the relevant government agencies and will take measures as recommended by the study.

5.3.8 Labour Environment

DGPC and DHYE in its operations ensures compliance with the Labour and Employment Act. Similarly, contractors operating in Bhutan have to adhere to the Labour and Employment Act 2007, Regulation on Occupational Health, Safety and Welfare 2002, Regulations on working conditions 2022 and also the Regulation on Occupational Health and Safety for Construction Industry 2002. Additionally, as migrant workers will be hired, the contractor will be required to comply with the Regulation on Foreign Workers Management 2022.

5.3.9 Sanitation, Safety and Security in Local Area

All the respondents had toilets inside their homes and access to piped water inside their homes. Tendu gewog is base to a wing of the Royal Bhutan Army and service by the Police Station at Tashichholeing Dungkhag.

When it come to the workers during pre-construction, construction and operational phase, the implementing agencies, by law are supposed to ensure the provision for safe drinking water and managed sanitation facilities and mitigated by the implementation of the OHS policy during the different phases.

5.3.10 Cultural Heritage

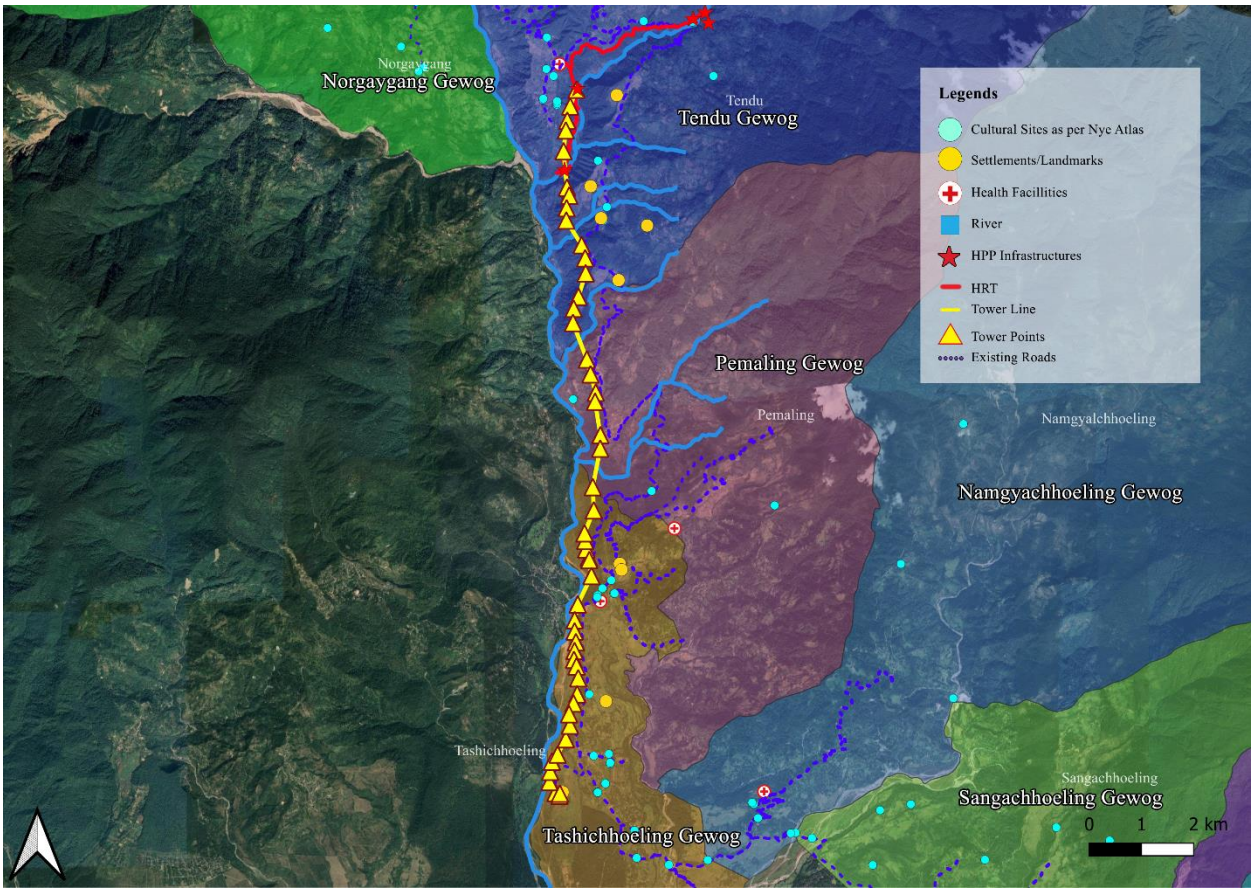
Based on interviews with local government officials and Tshogpas of the affected chiwogs, it was confirmed that the project would not have any impact on any cultural or heritage site. This was further validated by all 15 respondents to the survey confirming that there are no such sites located in the affected land.

Further based on the feedback from the Department of Culture from the National Stakeholder Meetings, data for cultural and heritage sites were obtained from the National Land Commission (Ney Atlas[2]) and publications on sites in Samdrup Jongkhar Dzongkhag from the Department were translated and their locations pinned on google maps with the help of the local government officials to ascertain the location of these sites. The data available was then plugged into GIS software and overlayed with the PTL components and buffers were generated around the PTL components to ascertain impacts.

Based on these interviews and GIS analysis of the data from National Land Commission and Department of Culture, it is concluded that there will be no impact on cultural and heritage sites that are significant nationally and locally.

The figures below provide an overview of the PTL viz a viz cultural and heritage sites.

[2] Ney refers to sacred sites



Map 5-1: Cultural Heritages, Health Facilities, Settlements around Transmission Line

5.3.11 Scenery

The TL project primarily traverses remote areas and forests, it is expected to have minor to insignificant impacts on visual aesthetics. However, during interviews with local governments, it was found that there is no tourism activities in the gewogs.

During the survey, respondents were asked how they feel about the impact of the project on the scenery and 7 of the respondents expressed that it does not make any difference as there are already other distribution lines transversing the geowgs, 1 felt positive about the changes which they associated with development and opportunities in the community and 6 shared negative feelings associated with damages caused to the environment and scenery.

However, as the proposed TL is running along the existing BPC distribution line, the project is expected to have minimal impact on the scenery.

5.3.12 Gender

The Labour and Employment Act of Bhutan 2007, which serves as the principal law relating to all matters of labour and employment is gender mainstreamed and includes sections which clearly establish non-discriminatory practices in Organizations. All Organizations in the country and required to comply and is enforced by the Ministry of Industry, Commerce and Employment. Bhutan also released its National Gender Equality Policy 2020 and provides an overarching directive for gender equality and women empowerment.

Hence, considering the above practices in Bhutan and this specific project being one which isn't targeting women empowerment specifically, it is concluded that no gender mainstreaming strategies need to be developed.

5.3.13 Accidents

Traffic Accidents concerns also were expressed as concerns by the respondents due to increased activity in the area. However, this may not be a major concern and can be overcome by close collaboration with the police units under the Dungkhags and also with the Dzongkhag Traffic unit in Samtse.

5.4 Social Impacts during Operation Phase

It is expected that most of the assessed impacts are taken care of during the period of construction activities. The Project is expected to have positive impacts on the communities during the construction phase. Usually, BPC outsources the annual works for clearing the right of way along the transmission line to the communities in the affected area and this creates seasonal jobs and employment opportunities for the residents. As the Transmission Line will be managed under the existing BPC Jogimara Substation, it is not expected to create additional settlements of population influx during the operation phase. Similarly, once the construction is completed, traffic flow is also expected to normalize. However, considering that the project infrastructure and associated operations and maintenance activities will take place during the operational phase, there would be likely impacts if appropriate mitigation measures are not undertaken.

5.4.1 Accidents

Workplace accidents are possible and considering the high voltage of the Transmission Line it is pertinent that Occupational Health, Safety and Welfare measures are operationalized, implemented and monitored by the BPC.

6 INFORMATION DISCLOSURE, PUBLIC CONSULTATION AND PARTICIPATION

6.1 Public Consultation

In accordance with *Article 16 of the Environmental Assessment Act (EA Act) 2000 and Chapter VI of the Regulations for the Environmental Clearance of Projects 2016*, a public consultation meeting was conducted involving affected individuals, Gewog administration, and the community. During this meeting BPC presented detailed information regarding the project, including its duration, objectives, and both positive and negative impacts. Public consultation meetings were held in all affected Gewogs, including the affected community forests, with specific objectives:

a) Raising awareness about the proposed project.

b) Consulting with and gathering recommendations from the Drungkhag and Gewog administration.

c) Providing an opportunity for communities in areas where the proposed transmission line is expected to pass to voice their concerns and issues.

d) Gathering feedback from affected individuals on anticipated problems and potential solutions.

The public consultation meeting consisted of two parts: first, presentations by BPC on project details, aims, objectives, analysis of alternatives, pros and cons, and explanations of relevant rules and regulations on land substitution and compensation. The second part included a presentation by the JICA consultant on ESIA aspects. It was held in national language (Dzongkha) mostly, with some translation in lhomtsamkha (nepali) occasionally.

Feedback from consultations revealed that residents of affected Gewogs had no prior knowledge of the proposed project but showed a positive attitude towards it, expressing approval. The local population demonstrated unwavering support, willing to offer their land in exchange for compensation or land substitution as per government rules. Concerns raised during the meeting included minimizing impacts on land and the environment, employment opportunities for locals, accurate measurement of affected land for tower construction, design routes to avoid inhabited areas, and ensuring adequate awareness during the construction period to prevent accidents.

The Local Consultation meetings for the Druk Bindu Transmission Line was organized from the 18th to the 19th of January 2024. Over the course of two days, project affected population including members of the affected community forestry groups and gewog officials from the Forest, Agriculture and Health were also present and the Land Registrar from the Dzongkhag Administration also attended the consultations.

During the consultation, the project overview, its potential positive and negative impacts including private land acquisition were presented by the BPC and JICA Survey Team and the floor was open to questions. Public Consultation Meetings were organized at the Gewog level in the affected gewogs.

< Tendu Gewog >

The Consultation meeting for Tendu Gewog was held on the 18th of January 2024 (Community Hall, Tendu Gewog Administration Office, 11:00 am to 2:00 pm). 13 (11 males, 2 females) participants were present for the consultation at Tendu. Comments and clarifications sought and responses are listed in the table below;

Table 6-1: Main Comments and Responses for Druk Bindu Transmission Line Consultation in Tendu Gewog

Comments/ Questions from participants	Response/ Explanation
A local resident asked "Are we allowed to carry out construction activities under the RoW?"	BPC clarified that as per existing rules, construction of building is prohibited in land falling under ROW of the TL. (BPC)
A local resident asked "In case of need to remove fruit bearing trees such as oranges and beetle nut, will compensation be based on multiple years of lost harvest opportunities in the future?"	BPC clarified that the existing norms, compensation would be one-time payment based on the rates provided by the Property Assessment and Valuation Agency. (updated every 3 years)
One participant expressed concern about neighbors blaming the participants for consenting to the proposed plans.	BPC clarified that every affected household will be affected and that if required other land owners will be consulted too if required.

Mr. Tshering Dorji, BPC invited the affected landowners for detailed review of how the proposed TL alignment will affect the identified plots. He thanked all stakeholder representative and landowners for their participation. This was followed by review of the TL alignment maps with each member after which members present signed the No Objection Certificates.

<Pemaling, Lalit, Tshongkhag, Biru Gewogs>

The Consultation meeting for Pemaling Gewog was held on the 19th of January 2024 (Lalit Tshongkhag, Biru, Pemaling Gewog, 10:00 am to 12:30 pm). 17 (13 males, 4 females) participants were present for the consultation. Comments and clarifications sought and responses are listed in the table below;

Table 6-2: Main Comments and Responses for Druk Bindu Transmission Line Consultation in Pemaling Gewog

Comments/ Questions from participants	Response/ Explanation
A local resident asked "Will TL construction entail use of explosives?"	BPC clarified that there will no use of explosives for the project.
A local resident asked "How will compensation be made in case of land acquisition?"	BPC clarified that as explained during presentation, there are two compensation options for land acquired by project. The owner can choose to go for cash compensation or land substitution/ replacement. Cash compensation will be based on the value of land acquired based on the applicable rates determined by Property Assessment and Valuation Agency (PAVA) and follow the LACRR 2022.

A local resident asked "What is the compensation rate for 'Doma' (betelnut) trees?"	BPC clarified Compensation for trees and crops falling in the ROW of the TL will be assessed by teams comprising of District Agriculture Officer, BPC and relevant sector representative.
A local resident asked "The existing distribution lines are low and risky. How high or low will the transmission lines be?"	The transmission line are much bigger and higher than the distribution lines. The towers will be more than 20 meters high.
A local resident asked "What are the compensation rules for Community Forest areas falling in ROW?"	BPC clarified that Community Forest land falling acquire for tower location are not eligible for substitution. However, trees removed for the purpose of tower location or ROW will be compensated. A detailed assessment will be carried out by Forest officials to work out the number of trees and volume to be removed. The total amount based on national royalty rates will be paid into the bank account of the CF group. (as per FNCA)

Mr. Tshering Dorji invited the affected land owners for detailed review of how the proposed TL alignment will affect the identified plots. He thanked all stakeholder's representative and landowners for their participation. This was followed by review of the TL alignment maps with each member after which members present signed the No Objection Certificates.

< Tashichhoeling Gewog>

The Consultation meeting for Tashichhoeling Gewog was held on the 19th of January 2024 (Community Hall, Tashichhoeling Gewog Administration Office, 11:00 am to 2:00 pm). 17 (13 males, 4 females) participants were present for the consultation. Comments and clarifications sought and reposnses are listed in the table below;

Table 6-3: Main Comments and Responses for Druk Bindu Transmission Line Consultation in Tashichhoeling Gewog

Comments/ Questions from participants	Response/ Explanation
Affected landowner shared past experience of poles/towers were placed in the middle of his plot and that he was not consulted.	BPC responded that the above concerns are related to past events/ Projects and has no relevance to the proposed TL project. Final placement will be carried out only after landowners' consent and signing of no objection form.

Mr. Tshering Dorji, BPC invited the affected landowners for detailed review of how the proposed TL alignment will affect the identified plots. He thanked all stakeholders, representatives, and landowners for their participation. This was followed by review of the TL alignment maps with each member after which members present signed the No Objection Certificates.

The record of discussions is attached as Appendix-6.

6.2 National Stakeholder Meeting

(1) The 1st National Stakeholder Meeting

The 1st National Stakeholder Meeting was held in English since all participants can understand it, at the Conference Le Meridien Hotel, Thimphu on the 1st of February 2024, attended by 29 (23 males, 6 females) participants from various Governmental agencies and non-governmental agencies from 9:30 am to 1:00 pm. During the consultation, the DGPC and BPC made detailed presentations of the Projects, its design, costs, potential impacts. The JICA Survey Team also made a presentation on the scoping list and the items under consideration for the assessment and the plan moving forward. The stakeholders were informed that a second consultation would be held in April to share the findings and conclusions of the assessment and sought their participation for continuity.

The meeting began with Presentations by the DGPC, BPC and JICA team. The Projects were presented separately and after each session, the floor was open for question and clarifications. The following questions were raised and suggestions from the stakeholders have been incorporated into the assessment.

The representative from the Department of Surface Transport asked if the impacts to the existing roads and bridges will be assessed as it can be assumed the movement of heavy trucks and machinery could have a detrimental impact on the road and also increase likelihood of accidents. DGPC clarified that they have already started the study on carrying capacity of the existing roads and bridges in collaboration with the relevant Ministries and are in discussion to improve the carrying capacity of the existing infrastructure.

The representative from the Bhutan Ecological Society sought clarity on how PAPs have they been consulted and how will the compensation be carried out. The team from DGPC and BPC informed the audience that public consultations have been organized and the no objection clearances from PAPs have been obtained. It was also informed that a PAP survey would also be carried out in the coming month to better understand the impact of land acquisition on the lives and livelihood.

The official from the Department of Forest and Park Services expressed her hope that the study would cover both flora and fauna aspect of bio-diversity and appropriate mitigation measures are proposed.

The representative from the Department of Culture asked for the inclusion of Heritage Site Impact Assessment based on information with the National Land Commission and additional information available from the Department. It was agreed that the data sets and publication would be shared for both the Dzongkhags and would be included in the ESIA.

The Representative from the Department of Law and Order, shared his views and concerns over the proximity of the Transmission Line with the Indian border and reminded the BPC team to ensure that at least 10 mtr buffer should be maintained with the International Border at all times. This was noted and the BPC team ensured that the Design provides more than 10 mtr buffer from the International Border along the whole line.

(2) The 2nd National Stakeholder Meeting

The 2nd National Stakeholder Meeting was held in English at the Conference Hall, Hotel Tashi Yidwong, Thimphu on the17th of April and attended by 31 (26 males, 5 females) participants from various Governmental agencies and non-governmental agencies from 9:30 am to 1:00 pm. The Meeting was chaired by the CEO, DHyE and the JICA survey Team made detailed presentation on the results of the Scoping and Impact Assessment, Proposed Mitigation measures, monitoring format and the budget outlay for the said measures for all the Projects.

The Official from the Department of Law and Order, inquired about the permanency of access roads and BPC acquisition of necessary approvals. He suggested that in cases which are close to the border areas for access road construction, it would be prudent, if permissions and approvals are also sought beforehand from the Department. BPC responded that all required approvals for access roads and ropeways will be included in the ESIA report.

The meeting was called to an end and the CEO, DHyE highlighted the importance of being mindful of budgetary constraints, noting that the projects are primarily aimed at serving domestic consumers and would eventually result in higher tariffs if costs are not managed.

The Record of discussion and participant list is attached as Appendix-7.

Tendu Public Consultation

Pemaling Public Consultation

Tashicholing Public Consultation

Figure 6-1: Glimpses of Public Consultation Meeting held for 66kV Druk Bindu TL

7 GRIEVANCE REDRESS MECHANISM

The overall structure of the GRM for the project shall be suited to redress the grievances through a single GRM with a Grievance Redress Committee (GRC). To address any complaints from an individual, a group or an institution about environmental and social issues among others associated with the implementation of the project, a Grievance Redress Committee (GRC) will be established.
The GRC will be constituted of representatives from Samdrup Jongkhar Dzongkhag Administration, Serthig, Langchenphug, Samrang, Pemathang, and Phuntshothang Gewog Administration and Project Management Units of the Projects. In Samtse, it will comprise of Samtse Dzongkhag Administration, Tendru, Pemaling, Tashichhoeling Gewog Administrations and Project Management Unit.
Once, the GRC is constituted at the start of the project, the contact information and procedure for GRM will be conveyed to the residents through the respective elected officials (Gup/ Tshogpa).

Table 7-1: Composition of the Grievance Redress Committee

SN	Designation	Organization	Role
1	Project Manager	BPC	‣ Coordinate the functioning of the GRC ‣ Compilation of Grievance Redress Reports
2	Land Registrar/ Representative	Survey Division, Dzongkhag Administration	‣ Member Secretary, Dzongkhag Land Acquisition and Compensation Committee ‣ Coordinate in Grievance resolution with other sectors (Competent Authorities)
3	Gup/ Tshogpa*	Gewog Administrations	‣ Receive complaints and submit to GRC for resolution from respective gewogs.

* Gup is the elected head of the Gewog and Tshogpa is the elected representative of the Chiwog (cluster of villages).
(Source; JICA Survey Team)

Types of anticipated grievances are, but not limited to the following:

- Land acquisition and compensation related grievances.
- Construction activities related grievances such as:
  - ✓ Blasting/vibration/damage to properties.
  - ✓ Physical environment related nuisance such as noise and dust.
- Traffic related complaints.
- Social related grievances such as conflict between project workers and local community, crime, etc.

Some of the roles of GRC are, but not limited to the following:

- Address project level grievances received.
- Consult relevant agencies and/or stakeholders as required by the nature of grievance to address it.
- Decide on compensation for AH/AP in line with relevant prevailing rates.
- Act as a link between project management, Dzongkhag/Gewog Administration, Contractors and the AHs/APs in relation to addressing the grievances.
- Monitor the grievance resolution process.
- Maintain database of all grievances.

The grievance redress mechanism for the Projects will follow the process described in Table below:

Table 7-2: Grievance Redress Process

Step 1: The aggrieved PAP/ Resident submits grievance in writing or orally in Dzongkha (national language) or English, to the respective Gewog Representative/ Contractors/ Project Director (Manager). These officials shall maintain a Grievance Record Register at the Gewog Administration Office, the Project Office and the Contractors Office for recording grievances submitted by PAPs/ Residents. **Step 2:** GRC is convened by the Project Director (Manager) within 21 days to acknowledge receipt of Grievance and hold consultations on grievance redressal. The complainant is then notified through the respective Gup/ Tshogpa of the decisions/ actions taken by the Committee to address the grievance. The time frame to resolve grievances will be subject to the nature of complaint and scale of investigation that would be needed. The GRC shall thereafter carry out necessary assessment and provide solutions. During this period, the Project Director/ Manager and/or Gup/Tshogpa shall provide updates and provide clarification to the aggrieved party whenever sought by aggrieved parties. In the case of Land and Compensation associated grievances, the matter will be forwarded to the DLACC and in the event the scope of the grievance is wide-ranging based on the nature of complaints received, relevant Competent Authorities (CAs) will be involved. **Step 3:** The aggrieved parties are not satisfied with the decision rendered by the GRC or, if he/she does not receive a response within 21 days; he/she can approach the Executives of DHyE/ BPC, and appeal existing local governments such as the Gewog Tshogde (local government assembly) and the Dzongkhag Administration or file a legal suit in the Dzongkhag Courts.

8 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS

8.1 Environmental Mitigation measures

The effectiveness of mitigation measures is maximized when they are:

i) Appropriately identified,

ii) Implemented promptly in accordance with required standards, and

iii) Monitored to ensure compliance with applicable standards.

The environmental sustainability of the project is highly dependent on the extent to mitigation measures for ambient environmental quality and biodiversity conservation are implemented in a timely manner and that the resulting environmental quality is within the prescribed limits. This is ensured through the following:

a) Preparation of an overall Environment Management Plan (EMP) for the proponent

b) Integration of environmental management requirements in contract documents for various work packages awarded to contractors.

c) Based on the overall EMP, contractors prepare the Contractor Environmental Management Plan (CEMP) containing:

   i) outline of environmental impacts and mitigation measures for the construction activities under the contract work packages.
   ii) Methods and schedule for periodical monitoring of ambient air, noise, and water quality, and terrestrial and aquatic biodiversity.
   iii) Schedule of monthly, semi-annual, and annual environmental monitoring reports demonstrating project compliance to environmental standards.

8.2 Social Mitigation Measures

The Project is expected to have impacts of Land Acquisition and resettlement of livelihood, loss of community forest resources, and labour environment for workers and accidents risks from increased traffic flow during the construction time.

8.2.1 Land Compensation and Support Measures

The Project will not entail any displacement of households but will require some acquisition of private and some resettlement of livelihoods as the acquired land are used for agricultural cultivation. It will also impact 3 community forest and result in the de registration of the land from the CF group and owned by the Government. The determination of market prices of land is difficult and speculative. Rural lands in Bhutan are hardly sold in open market and accessibility to land transaction records for analysis is not possible.

During meetings with the Officials at the National Land Commission and the Land Registrars at the Dzongkhag Administration, it was shared that the transaction prices reflected during ownership transfers are usually under invoiced for tax avoidance purposes and does not reflect actual market prices. The Dzongkhags do not maintain any data base or track land transaction prices. The officials also expressed that there are very minimal land transactions in the rural areas and hence prices tend be based on the speculative, emotional and familial (relationship) values rather. DGPC also wrote to the National Land Commission seeking data from their repository for Land Transactions, however, it was not received.

On the policy front, the Environmental Assessment Guideline for Hydropower Projects, 2012, does suggest compensation to be paid at current market prices, the National Land Act 2007 and the Land Acquisition and Compensation Rules and Regulations (LACRR) 2022, clearly state that land shall be acquired based on the Property Assessment and Valuations Agency rates, which are updated every three years., under the Ministry of Finance. The Form used for Land Valuation under the LACRR 2022 by the DLACC is attached as Appendix-8.

The following are expected impacts from the Project on Land and associated livelihood:

1) Acquisition of Private Land

The Project requires the acquisition of 0.084 acres of land for Tower Construction belonging to 3 households in Tendu, Pemaling and Tashichhoeling Gewogs. The estimated cost for the acquisition of the Private Land is as under:

Table 8-1: Estimated cost for the acquisition of the Affected Privates land of the TL

SN	Tower Number	Gewog	Owner	CID	Land Type	Land Area Affected (Acres)	Land Class (PAVA 2022)	Compensation PAVA RATE (Nu)
1	AP43	Trashichhoeling	Tara Man Gurung	11214001868	Kamzhing	**0.018**	D (Nu.2860.52)	5,148.936
2	AP18	Pemaling	Sey Dema	11202000381	Chhuzhing	**0.018**	D (Nu.2574.47)	4,634.046
3	AP12	Tendruk	Mumta Rai	11202002102	Kamzhing	**0.018**	D (Nu.2860.52)	5,148.936
TOTAL								**14,931.918**

The private land acquired are of dry land. Considering the small size of the acquisition the associated damages to the crops be compensated as per the PAVA Compensation rates 2022 and calculated during site verification jointly with the Agriculture Official (existing practice of BPC). This compensation will be provided by the BPC through its internal funds.

2) Impact by RoW

There are two impacts expected from the PTL project by RoW. 15.887 Acres of Land belonging to 57 households in 4 gewogs are affected by the RoW of the project. However, in the case of RoW, it

is expected that there will be no damages to crops, and efforts are made to minimize damages. However, in the case of unforeseen damages, the BPC Project office shall consult the affected household and carry out joint verification to assess the damages and be compensated as per national laws and practices.

The RoW will also have an impact on 3 Community Forest Groups, 1 in Serthi and 2 in Pemathang Gewogs. However, the impact on livelihood from collection of non-wood forest products are expected to be minimal as the households are also allowed to collect the same from State Reserve Forest Land. However, this will have an impact on the timber that the CF Group can use from the CF. In this regard, the Forest and Nature Conservation Act 2023, state that the CF will receive a minimum royalty payment determined by the Department may be paid to the Community Forest Management Group (CFMG) for each tree cut in their community forest. A joint tree enumeration and verification is conducted by Forest officials, CF management, and BPC and concern contractor/s during the construction phase.

3) Entitlement Matrix

Compensation for the project affected peoples is summarized in the table of Entitlement Matrix in the below.

Entitlement Matrix for Transmission Line			
Sl.	**Type of loss**	**Entitled Persons (Beneficiaries)**	**Entitlement (Compensation Package)**
1	Permanent Acquisition of Agriculture and Institutional Lands	Legal owner(s) of the land	Land-for-land compensation or cash compensation.
			An entitlement of Nu. 2,392.60 will be provided to develop 1 decimal of undeveloped replacement land into wet land.
			Provision of services and payment of service charges in regard to registration of ownership title deeds (thram) of the affected HHs.
2	Temporary Loss of Agriculture Lands (Land on Lease)	Legal owner(s) of the land	Rate for lease of land as per the Rules and Regulation for Lease of Government Reserved Forest Land and Government Land 2009.
3	Loss of Cash Crops and Fruit Trees	Legal owner(s) of the cash crops or fruit trees	Cash compensation for loss of cash crops and fruit trees will be paid as per the LCR 2022.
4	Loss of trees for use by Community Forest Group	Community Forest Group	Payment of Royalty for Trees cleared for RoW.
5	Unforseen impacts (due to clearing for construction of Transmission Line)	Legal owner(s) of the cash crops or fruit trees	Cash compensation for loss of cash crops and fruit trees will be paid as per the LCR 2022.

8.3 Mitigation measures for Pre-Construction phase

Table 8-2: Mitigation measures for Pre-Construction phase

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
1	Air Quality	‣ Air pollutant emissions caused by heavy machine and vehicles from the implementation of pre-construction work such as clearing the land, cutting down trees, and transporting equipment for surveying.	‣ Appropriately maintain the equipment and vehicles used and reduce the generation of air pollutants. ‣ During pre-construction work, water will be sprayed as necessary to prevent dust generation. ‣ Reduce speed on existing unpaved access roads to prevent dust generation.	‣ BPC	‣ BPC	Nu.182,000 has been earmarked for planning and monitoring on Air Quality, Noise level and Water Quality.
2	Noise and Vibration	‣ Noise and vibration caused by the implementation of pre-construction work.	‣ Appropriately maintain and manage the equipment and vehicles used to reduce noise and vibration.	‣ BPC	‣ BPC	Ditto
3	Land acquisition and Resettlement	‣ Land Acquisition for Tower Construction and associated damages to agricultural produce.	‣ Provide Compensation / Replacement for land acquisition and compensation for resettlement of livelihood from damages to agriculture.	‣ BPC	‣ BPC	Estimated at Nu. 15,000

8.4 Mitigation measures for Construction and Operational Phase

Mitigation measures for the impacts identified in the preceding section must be geared towards i) maintaining the ambient air, noise, and water within the prescribed national limits as per NEC's national Environmental Standards 2020 (NEC, 2020) and ii) minimizing impacts on biodiversity especially those species with special global and national protection status as per IUCN Red list and Bhutan's FNCA, 2020. Keeping these requirements in minds, the mitigation measures for construction and operational phase of the project are identified in the Table 8-3 below.

Table 8-3: Proposed mitigation measures for assessed impacts of project activities on environmental quality during and after construction

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
1	Air Quality	‣ Due to the operation of construction equipment and transport vehicles, the generation of exhaust gases and dust will affect the atmosphere around the site.	‣ Ensure proper maintenance of equipment and vehicles used and reduce emissions of air pollutants. ‣ During construction works, water will be sprayed as necessary to prevent dust generation. ‣ Reduce speed on existing unpaved access roads to prevent dust generation. ‣ When transporting earth, sand, etc., do not fill the load fully, but cover it with plenty of room. ‣ Effectively educate and train relevant personnel such as operators of equipment and drivers of vehicles.	‣ BPC ‣ Contractor	‣ BPC	Nu.182,000 has been earmarked for planning and monitoring on Air Quality, Noise level and Water Quality.
2	Wastes	‣ Cutting and de-rooting result in plant bodies becoming waste. ‣ Waste is generated in the workers' camp. ‣ Solid waste generated if not managed well could potentially pollute the land and water environment impacting the animals.	‣ Plants are not discarded, but used for soil retention and surface cover to prevent soil erosion and also encourage regeneration where possible. ‣ Train workers on storage methods, waste handling, prevention of leakage/disposal and what to do in the event of a leak, and provide them with the personal protective equipment necessary for handling hazardous waste. ‣ Waste management plans, which state the steel chips/scrapes will be dispatched off to authorized waste dealers in project area or Thimphu and combustible garbage is collected and treated from the site for proper disposal at an approved facility.	‣ BPC ‣ Contractor	‣ BPC	Not earmarked
3	Soil Quality	‣ Spills of lubricating oil, fuel oil, etc. from heavy machinery	‣ Ensure that lubricants and fuel oils are properly managed to secure the facility of stocked oil to prevent it from tipping over and that a receptacle is available in case of spillages when refilling.	‣ BPC ‣ Contractor	‣ BPC	Part of the operational cost of BPC

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
4	Noise and Vibration	‣ Use of construction machineries, excavations and blasting activities generate noise and vibration which might disturb wild animals and communities nearby.	‣ Appropriately maintain and manage the equipment and vehicles used to reduce noise and vibration. ‣ If the noise levels within the project area exceed permissible limits, increased noise levels will be managed not to exceed the appropriate level based on National Noise Standard level through Noise Management Plan. ‣ Construction activities, especially noisy ones, should be limited to daytime only and avoided at night and on weekends.	‣ BPC ‣ Contractor	‣ BPC	Nu.182,000 has been earmarked for planning and monitoring on Air Quality, Noise level and Water Quality.
5	Odor	‣ Generation of odor due to improper waste management.	‣ Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the accumulation of odor, pest control problems, general litter and other nuisance sources of waste on the site.	‣ BPC ‣ Contractor	‣ BPC	Part of the operational cost of BPC
6	Biodiversity	‣ Deterioration of ecosystem by cutting trees, clearing and de-rooting by carrying out for tower construction work including access road. ‣ Change in land use may restrict displacement and access to the feeding, breeding and reproduction areas of species and traditional mitigation routes may be disturbed.	‣ Proper wildlife or alien plants management. ‣ Animals and plants (endangered species) that are expected to be directly affected by during construction work is be moved and transplanted to suitable habitats. ‣ Animals that have been injured by the development act are protected and returned to a safe place after healing. ‣ Make a new detour for migratory animals (beast trail) such as elephant by cutting lianas and shrubs.	‣ BPC ‣ Contractor	‣ BPC	Not earmarked
7	Land acquisition and Resettlement	‣ Land Acquisition for Tower Construction and associated damages to agricultural produce. ‣ Damages to crop during laying and stringing of transmission line.	‣ Provide Compensation / Replacement for land acquisition and compensation for resettlement of livelihood from damages to agriculture. ‣ Provide compensation for the damages for livelihood resettlement.	‣ BPC (Project Office) ‣ Contractor	‣ BPC	Estimated at Nu. 15,000
8	Labour Environment	‣ Accidents by construction work ‣ Access to Toilet	‣ Prepare and ensure implementation of the Occupational Health and Safety (OHS) Standards in OHS regulations for the construction company,	‣ BPC ‣ Contractor	‣ BPC ‣ Ministry of Industry,	Measures can be taken through

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
	(including sanitation and safety)	‣ Access to Water	such as prepare the health and safety policy, appointment of safety officer, use of protective equipment, instruction of establishment of toilet and water facility, etc..		Commerce and Employment	standard, and special cost is not required / Contractor Cost
9	Accidents	‣ Accident due to increased traffic	‣ Work with local traffic police for traffic management.	‣ BPC ‣ Contractor	‣ BPC	Contractor Cost

Table 8-4: Mitigation measures of Operational Phase

No	Items (impacts)	Sources of Potential Impact	Proposed Mitigation Measures	Implementing Organization	Responsible Organization	Cost
1	Biodiversity	‣ Inhibition of the migration pathways of large mammals such as elephants by newly build towers. ‣ Bird strike caused by Transmission line or towers. ‣ Contact between trees and overhead transmission line in the Right of Way (ROW).	‣ Construct a new detour for migratory animals such as elephant. ‣ To reduce accidents from collisions, placing fluttering banners and brightly-colored (orange, yellow, white, etc.) spirals on power lines. ‣ Regular tree pruning in the Right of Way (ROW).	‣ BPC	‣ BPC	Not earmarked
2	Accidents	‣ Workplace accidents	‣ Conduct Safety Management including periodic safety awareness program and use of protective equipment (footwear, helmets, goggles, eye-shields, safety belts, etc.) Training.	‣ BPC	‣ BPC	Estimated at Nu. 46,000

8.5 Environmental Monitoring measures

The Environmental Monitoring Forms for the Project is attached as Appendix-2.

8.5.1 Monitoring during Pre- Construction Phase

Table 8-5: Monitoring measures during Pre-Construction phase

No	Items (impacts)	Mitigation Measures	Monitoring Items	Standard	Monitoring Sites	Implementing Organization	Term/ Frequency	Cost
1-1	Air Quality	‣ Appropriately maintain the equipment and vehicles used and reduce the generation of air pollutants.	‣ $PM_{2.5}$, PM_{10}, NO_X, SO_X, CO	$PM_{2.5}$ 40 (1-year) 60 (24-hour) PM_{10} 60 (1-year) 100 (24-hour) NO_X 60 (1-year) 80 (24-hour) SO_X 60 (1-year) 80 (24-hour) CO 2,000(8-hour) 4,000(1-hour) [$\mu g/m^3$] (ENVIRONMENTAL STANDARDS, 2020, NEC)	‣ Boundaries of dwellings of Tendu, Biru(Pemaling) and Sipsu(Tashicholing) (Coordinates of sampling location, see *1 Notice (Monitoring Sites) listed at the end of the table)	‣ BPC	‣ One time every Monsoon and Post-Monsoon	Nu.182,000 has been earmarked for planning and monitoring on Air Quality, Noise level and Water Quality.
1-2		‣ During pre-construction work, water will be sprayed as necessary to prevent dust generation.	‣ Number of times of water spray	N/A	‣ Project area and its surrounding area		‣ At any time	
		‣ Reduce speed on existing unpaved access roads to prevent dust generation	‣ Speed level	‣ Speed of compliance	‣ Project area and its surrounding area		‣ At any time	
2	Noise and Vibration	‣ Appropriately maintain and manage the equipment and vehicles used to reduce noise and vibration.	‣ Noise level	‣ Daytime: 55 dBA ‣ Nighttime: 45 dBA (Sensitive area) ‣ Daytime:65 dBA ‣ Nighttime:55 dBA (Mixed area)	‣ Boundaries of dwellings of Tendu, Biru(Pemaling) and Sipsu(Tashicholing) (Coordinates of sampling location, see *1 Notice (Monitoring Sites)	‣ BPC	‣ One time every Monsoon and Post-Monsoon	cdxxvii. Ditto

					listed at the end of the table)			
3	Land acquisition and Resettlement	‣ Provide Compensation for land acquisition and resettlement of livelihood	‣ Number of Households ‣ Provided with Land Replacement ‣ Provided with cash compensation ‣ Provided with Crop Compensation	N/A	‣ Chiwog, Gewog and Dzongkhag	‣ Project Management ‣ BPC	Monthly	Part of operational cost of project office of BPC

8.5.2 Monitoring during Construction Phase

Table 8-6: Monitoring measures during Construction phase

No	Items (impacts)	Mitigation Measures	Monitoring Items	Standard	Monitoring Sites	Implementing Organization	Term/ Frequency	Cost
1-1	Air Quality	‣ Ensure proper maintenance of equipment and vehicles used and reduce emissions of air pollutants	‣ $PM_{2.5}$, PM_{10}, NO_X, SO_X, CO	$PM_{2.5}$ 40 (1-year) 60 (24-hour) PM_{10} 60 (1-year) 100 (24-hour) NO_X 60 (1-year) 80 (24-hour) SO_X 60 (1-year) 80 (24-hour) CO 2,000(8-hour) 4,000(1-hour) [μg/m³] (ENVIRONMENTAL STANDARDS, 2020, NEC)	‣ Boundaries of dwellings of Tendu, Biru(Pemaling) and Sipsu(Tashicholing) (Coordinates of sampling location, see *1 Notice (Monitoring Sites) listed at the end of the table)	‣ BPC ‣ Contractor	‣ One time every Quater	Nu. 61,000 per monitoring.
1-2		‣ During construction works, water will be sprayed as necessary to prevent dust generation.	‣ Records of water sprinkling.	N/A	‣ Project area and its surrounding area		‣ At any time	
1-3		‣ Reduce speed on existing unpaved access roads to prevent dust generation.	‣ Speed level	‣ Speed of compliance	‣ Project area and its surrounding area		‣ At any time	

No	Items (impacts)	Mitigation Measures	Monitoring Items	Standard	Monitoring Sites	Implementing Organization	Term/ Frequency	Cost
		‣ When transporting earth, sand, etc., do not fill the load fully, but cover it with plenty of room.	‣ Loading capacity and protective netting	N/A	‣ Project area and its surrounding area		‣ At any time	
		‣ Effectively educate and train relevant personnel such as operators of equipment and drivers of vehicles.	‣ Holding workshops	N/A	‣ Project area		‣ Once every 3 months	
2-1	Wastes	‣ Plants are not discarded, but used for soil retention and surface cover to prevent soil erosion and encourage regeneration where possible.	‣ Number of Plant species and distribution	N/A	‣ Project area	‣ BPC ‣ Contractor	‣ One time every Monsoon and Post-Monsoon	Monitoring cost mostly travel cost will be booked to respective offices
2-2		‣ Train workers on storage methods, waste handling, prevention of leakage/disposal and what to do in the event of a leak, and provide them with the personal protective equipment necessary for handling hazardous waste.	‣ Holding training workshops	N/A	‣ Project area	‣ BPC ‣ Contractor	‣ Once every 3 months	
3	Soil Quality	‣ Ensure that lubricants and fuel oils are properly managed to secure the facility stocked oil to prevent it from tipping over and that a receptacle is available in case of spillages when refilling.	‣ Checking of tipping prevention devices such as oil storage tanks and emergency equipment in the event of a leak.	N/A	‣ Project area	‣ BPC ‣ Contractor	‣ At any time	Monitoring cost mostly travel cost will be booked to respective offices
4-1	Noise and Vibration	‣ Appropriately maintain and manage the equipment and vehicles used to reduce noise and vibration.	‣ Noise and Vibration level.	‣ Daytime: 55 dBA ‣ Nighttime: 45 dBA (Sensitive area) ‣ Daytime:65 dBA	‣ Boundaries of dwellings of Tendu, Biru(Pemaling) and Sipsu(Tashicholing)	‣ BPC ‣ Contractor	‣ one time every Quater	Nu. 61,000 per monitoring.

No	Items (impacts)	Mitigation Measures	Monitoring Items	Standard	Monitoring Sites	Implementing Organization	Term/ Frequency	Cost
4-2		‣ If the noise levels within the project area exceed permissible limits, increased noise levels will be managed not to exceed the appropriate level based on National Noise Standard level through Noise Management Plan.	‣ Noise and Vibration level	‣ Nighttime:55 dBA (Mixed area)	(Coordinates of sampling location, see *1 Notice (Monitoring Sites) listed at the end of the table)	‣ BPC ‣ Contractor	‣ At any time	
4-3		‣ Construction activities, especially noisy ones, should be limited to daytime only and avoided at night and on weekends.	‣ Noise and Vibration level			‣ BPC ‣ Contractor	‣ At any time	
5	Odor	‣ Proper transport of waste and dumping of waste into designated disposal facilities by licensed contractors to avoid the accumulation of odor, pest control problems, general litter and other nuisance sources of waste on the site.	‣ Sensory, Odor index ‣ Complaint record	Odor index, see *2 Notice (Monitoring Sites) listed at the end of the table	‣ Project office and material storage	‣ BPC ‣ Contractor	‣ Once a week	Monitoring cost mostly travel cost will be booked to respective offices
6	Biodiversity	‣ Proper wildlife or alien plants management. ‣ Animals and plants (endangered species) that are expected to be directly affected by during construction work is be moved and transplanted to suitable habitats. ‣ Animals that have been injured by the development act are protected and returned to a safe place after healing.	‣ Number of Plant and distribution. ‣ Number of animal species and distribution.	N/A	‣ Project area and its surrounding area	‣ BPC ‣ Contractor	‣ At any time	Nu. 125,000 per monitoring.

No	Items (impacts)	Mitigation Measures	Monitoring Items	Standard	Monitoring Sites	Implementing Organization	Term/ Frequency	Cost
7	Land acquisition and Resettlement	‣ Provide Compensation for land acquisition and resettlement of livelihood	‣ Number of Households ‣ Provided with Land Replacement ‣ Provided with cash compensation ‣ Provided with Crop Compensation	N/A	‣ Chiwog, Gewog and Dzongkhag	‣ Project Management, BPC ‣ Dzongkhag Administration, Dungkhag Administration and Gewog Administration	Monthly	Part of operational cost of project office of BPC
8	Labour Environment (including sanitation and safety)	‣ Plan and implement Labour management plan in accordance with OHS regulations for the Construction Industry.	‣ Number of workplace accident ‣ Access to toilets with managed waste for the workers ‣ Access to potable water to the workers	N/A	‣ Project Site	‣ BPC ‣ Contractor/ Project Office	Monthly	Part of operational cost of project office of BPC
9	Accidents	‣ Work with local traffic police for traffic management	‣ Accident due to increased traffic	N/A	‣ Project Site, Traffic Police Unit, Samtse	‣ BPC ‣ Contractor/ Project Office	Monthly	Part of operational cost of project office of BPC

8.5.3 Monitoring during Operational Phase

Table 8-7: Monitoring measures during Operational phase

No	Items (impacts)	Mitigation Measures	Monitoring Items	Standard	Monitoring Sites	Implementing Organization	Term/ Frequency	Cost
1-1	Biodiversity	‣ Construct a new detour for migratory animals such as elephant.	‣ Numbers and species of dead or injured animals.	N/A	‣ Project area	‣ BPC	‣ At any time	Nu. 125,000 per monitoring.
1-2		‣ To reduce accidents from collisions, placing fluttering banners and brightly-colored (orange, yellow, white, etc.) spirals on power lines.	‣ Numbers and species of dead or injured birds.	N/A	‣ Project area	‣ BPC	‣ At any time	

1-3		‣ Regular tree pruning in the Right of Way (ROW).	‣ Numbers of trees cut down.	N/A	‣ Inside of ROW	‣ BPC	‣ One time in every three years	Part of operational cost of project office of BPC
2	Accidents	‣ Conduct Safety management training	‣ Number of workplace accidents.	N/A	‣ Along the Transmission line	‣ BPC	Monthly	Estimated at Nu. 46,000

[Monitoring Sites]

*1; Coordinates of sampling location

Station Name		Latitude	Longitude
1	Tendu	27°6'53.70552"	88°52'27.36228"
2	Biru (Pemaling)	27°3'47.38176"	88°53'07.06488"
3	Sipsu (Tashicholing)	27°2'24.27144"	88°53'07.36224"

*2; Odor index

	Indications for judgment
0	Odorless
1	Odors that can finally be detected (detection threshold)
2	Weak smell that tells you what it smells like (cognitive threshold)
3	Smells that can be easily detected
4	Strong odor
5	Intense smell

(offensive odor control law, 1971, Japan)

8.6 Tentative Costs for Implementation of the ESMP

Based on discussions with the Environment and Social Unit officials in the BPC, it was ascertained that the BPC has been practicing allocating 3% of total project costs towards Environmental & Social Management Plans (ESMP). However, for the current project, the ESMP costs are calculated based on specific activities. The estimated budget for implementing the ESMP and environmental monitoring plan for the proposed Druk Bindu 66kV transmission line project is outlined in the table below.

Table 8-8: Tentative budget for ESMP and Environmental Monitoring

SN.	ITEM & ACTIVITIES	Unit	Cost (Nu. In million)
A. Construction Phase			
1	Cash Compensation for 3 Affected Land owners.	As per the existing PAVA rates	0.015
2	Cash Compensation for direct damages to standing crops under RoW during construction phase.	Lump sum	0.200
3	Royalty for Tree cut in the 2 Affected Community Forests	Royalty fee for class A trees in CF	1.037
4	Compliance Monitoring by BPC: Includes Quarterly testing of Ambient Air Quality, Noise Level, and water quality test in the project area. Quarterly Monitoring of OHS and compliance to terms & conditions of ESIA document & Environmental Clearance of the project.	Nu.1500 TADA of 1 Officials × 4 times × 10 days for 2 years (18months) + Hiring vehicle charges	0.182
5	Community Awareness Campaigns on Environmental, Health and Safety for workers of Power transmission line	Nu.1500 TADA of 1 Officials × 1 time × 10 days for 2 years (18months) + Hiring vehicle charges	0.092
6	Compensatory Afforestation/Plantation Program	Nu. 84/ sapling including 3 years maintenance cost × No. of trees clearing in TL RoW.	0.638
7	Installations of Power line bird diverters (Marker balls) in critical locations	15 numbers of Markers balls × Nu. 8365 (including Freight charges from India)	0.125
B. Operation Phase			
1	Community Awareness Campaigns on Environmental, Health and Safety of Power transmission line	Nu.1500 TADA of 1 Officials × 1 time × 10 days + Hiring vehicle charges	0.046
Total (Nu. In millions)			**2.335**

8.7 Implementation Structure

The implementation system of the environment management plan and environment monitoring plan for the project is shown below during Pre-construction, during construction and operation phases. BPC will be the Executing Agency (EA) responsible for management, coordination and execution of all activities. Therefore, BPC will take the lead in the environmental management structure and will be responsible for leading the implementation of the EMP.

BPC will then enter into a construction contract with a contractor, and mitigation measures and environmental monitoring during construction will be performed by the contractor who is awarded the contract. This will be monitored and enforced by the BPC Project Office which will be located at the site.

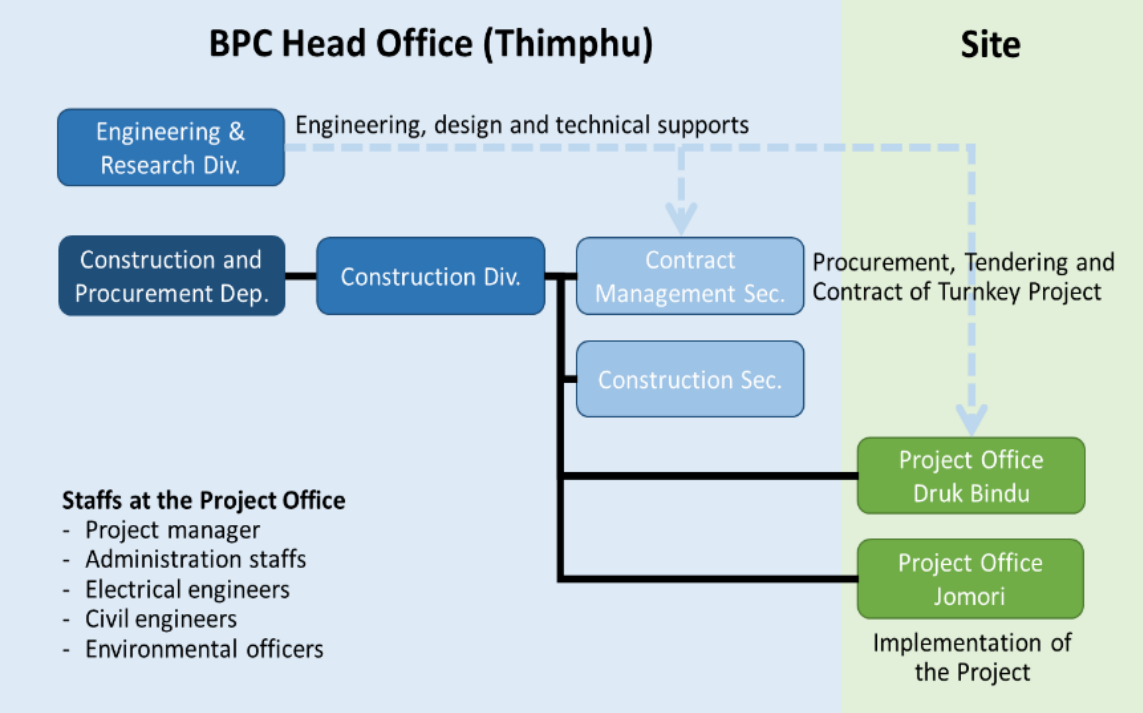


Figure 8-1: Implementation structure for BPC.

9 CONCLUSION AND RECOMMENDATIONS

In conclusion, the comprehensive survey conducted within the proposed transmission line area revealed a rich diversity of flora and fauna. The vegetation assessment highlighted the presence of numerous plant species, with occurrences of endangered and vulnerable species, underscoring the ecological significance of the area. The Shannon diversity indices indicated varying degrees of floral diversity across sampled plots, with an overall high floral diversity index for the entire area. Similarly, tree species diversity assessments showcased heterogeneous biodiversity levels, emphasizing the need for tailored conservation efforts. Moreover, analyses of tree density and volume provided insights into the distribution and abundance of trees, crucial for informed decision-making regarding land use and development.

In terms of wildlife, the survey recorded a diverse array of species, including mammals, birds, amphibians, and fish, with several species categorized under conservation concern by the IUCN Red List. The findings underscore the importance of preserving habitat integrity to support the diverse wildlife populations inhabiting the area. Overall, the survey outcomes provide valuable baseline data essential for effective environmental management and conservation planning within the proposed site, ensuring sustainable development practices and biodiversity conservation efforts are harmonized for the benefit of both human communities and the natural environment.

From the Social Consideration perspective, the PAP survey provided evidence that, none of the affected households are socially vulnerable, no ethnic minorities or indigenous group will be impacted, there will be no resettlement of households and impact on land will be limited to only 28 households, of which only 3 will be affected by permanent land acquisition (0.054 acres) and the rest are impacted by RoW, which is expected not impact on livelihoods as it would only restrict construction of infrastructure in the demarcated area. The Project is much more likely to have beneficial impacts of improved electricity, improved road connectivity, potential for employment and business opportunities for the whole community in the affected gewogs.

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Department of Environment and Climate Change
Ministry of Energy and Natural Resources
Royal Government of Bhutan
Thimphu

BHUTAN
Believe

DECC/EACD/Agency/2024/ 447 **March 27, 2024**

Sr. Environment Officer
Environment, GIS & Survey Unit
Contract Division
Bhutan Power Corporation Limited
Thimphu

Subject: Approval to conduct IEE study for Druk Bindu Hydropower Project Transmission Line

Sir,

This has reference to your email dated March 25, 2024 on the construction of 14 km 66 kV Druk Bindu Hydropower Project Transmission Line.

In this regard, the Department of Environment and Climate Change (DECC) noted that the length and the voltage of the proposed transmission line is relatively small. Further, the transmission line alignment does not pass through or intersect with any critical or biologically sensitive areas. Additionally, the DECC has taken note that the proposed project is of national importance.

Therefore, considering the nature of the proposed project and its urgency of obtaining Environmental Clearance to secure financial support from JICA, the DECC will accept the duly filled IEE form for transmission line. However, kindly ensure that all the necessary documents such as public consultation record and written consent (if there are direct impacts on the properties owned by an individual) for transmission lines are submitted and duly authenticated by the concerned local authority. Further, kindly note to submit all necessary information as required under the existing environmental legislations.

Should you require any clarification, please contact the Environment Assessment and Compliance Division of DECC at 02-323384.

Sincerely,

(Singye Wangchuk)
Offtg. Chief Environment Officer

Copy to:

1. Guard file (EACD/Agency) DECC, MoENR for record.

Appendix 2 : Environmental Monitoring Form for Druk Bindu Transmission Line

<Pre-construction Phase>

(a) Air pollution

- Monitoring item: PM_{10}, $PM_{2.5}$, SO_X, NO_X, CO
- Record: measurements are taken One time every Monsoon and Post-Monsoon before and after felling and clearing, at the boundaries of neighboring dwellings

(Date)
(Location)

(Data) Item (Unit.)	Baseline value	Measured value (Average value)	Measured value (Max. value)	Local standard*	Referred to international standards**	Remarks (e.g. location, frequency and method of measurement)
PM_{10} ($\mu g/m^3$)				60 (1-year) 100 (24-hour)	20 (1-year) 50 (24-hour)	Measured by PM meter for 30 minutes
$PM_{2.5}$ ($\mu g/m^3$)				40 (1-year) 60 (24-hour)	10 (1-year) 25 (24-hour)	Measured by PM meter for 30 minutes
SO_X ($\mu g/m^3$)				80 (24-hour)	20 (24-hour) 500 (10 minute)	
NO_X ($\mu g/m^3$)				80 (24-hour)	40 (1-year) 200 (1-year)	
CO ($\mu g/m^3$)				2000 (24-hour)	-	

*Note: * = National standard for ambient air quality (NEC,2020)*
*Note: ** = WHO Air Quality Guideline, 2021 (WHO, 2021)*

(b) Noise and vibration

Noise levels

- Monitoring item: noise levels
- Record: measurements are taken One time every Pre-Monsoon and Post-Monsoon before and after felling and clearing at the boundaries of neighboring dwellings

(Date)
(Location)

(Data) Item (Unit.)	Baseline value	Measured value (Average value)	Measured value (Max. value)	Local standard*	Referred to international standards**	Remarks (e.g. location, frequency and method of measurement)
Noise level (dB A)				[Sensitive Area] Daytime: 55 dBA Nighttime: 45 dBA [Mixed Area] Daytime: 65 dBA Nighttime: 55 dBA Maximum value allowed in workplace at any point of time is 75 dB(A)	[Sensitive Zone] Daytime: 55 dBA Nighttime: 45 dBA [Industrial zone] Daytime:70 dBA	

*Note: * = National standard for ambient air quality (NEC,2020)*
*Note: ** = IFC/WB Guideline*

(c) Land acquisition and resettlement

Land Compensation and Replacement

- Monitoring item: Land Compensation, Replacement and Crop Compensation
- Record: PAPs provided with Land Replacement, Land Compensation and Crop Compensation.

SN	Progress Indicator	Frequency
1	Number of affected HHs losing land been compensated (cash) for Land	monthly
2	Number of affected HHs provided land replacement	monthly
3	Number of affected HHs provided with Crop Compensation (cash)	monthly

(d) Complaints

i) Natural Environment

- Monitoring item and record: complaints from local government and residents

Date	Item	Complaint by	Complaint details	Action	Remarks (resolution status)

ii) Land Acquisition

- Monitoring item and record: complaints from local government and residents including PAPs on Land Acquisition

Date	Complaint by	Details of Complaint	Action	Remarks (resolution status)

<Construction Phase>

(a) Air pollution

- Monitoring item: PM_{10}, $PM_{2.5}$, SO_X, NO_X, CO
- Record: measurements are taken One time every Quater before and during the construction of the towers, at 63 tower locations and at the boundaries of neighboring dwellings.

(Date)
(Location)

(Data) Item (Unit.)	Baseline value	Measured value (Average value)	Measured value (Max. value)	Local standard*	Referred to international standards**	Remarks (e.g. location, frequency and method of measurement)
PM_{10} ($\mu g/m^3$)				60 (1-year) 100 (24-hour)	20 (1-year) 50 (24-hour)	Measured by PM meter for 30 minutes
$PM_{2.5}$ ($\mu g/m^3$)				40 (1-year) 60 (24-hour)	10 (1-year) 25 (24-hour)	Measured by PM meter for 30 minutes
SO_X ($\mu g/m^3$)				80 (24-hour)	20 (24-hour) 500 (10 minute)	
NO_X ($\mu g/m^3$)				80 (24-hour)	40 (1-year) 200 (1-year)	
CO ($\mu g/m^3$)				2000 (24-hour)	-	

*Note: * = National standard for ambient air quality (NEC,2020)*
*Note: ** = WHO Air Quality Guideline, 2021 (WHO, 2021)*

(b) Waste

- Monitoring item: waste storage and transport conditions
- Record: once a week, at the workers' camp and construction site, the amount of waste collected and disposed of by item by the waste collection and disposal contractor
- Check contractor's record ledgers

Date	Point	Monitoring item	Status during the reporting period.
		Amount of waste collected	

(c) Soil pollution

- Monitoring item: fuel, lubricating oil and other leaks
- Record: record at any time at the construction site and at the workers' camp
- Check the operator's record ledger

Date	Point	Monitoring item	Status during the reporting period.
		Fuel, lubricating oil and other leaks	

(d) Noise and vibration

Noise levels

- Monitoring item: noise levels
- Record: measurements are taken One time every Quater before and during the construction of the towers, at 63 tower locations and at the boundaries of neighboring dwellings.

(Date)
(Location)

(Data) Item (Unit.)	Baseline value	Measured value (Average value)	Measured value (Max. value)	Local standard*	Referred to international standards**	Remarks (e.g. location, frequency and method of measurement)
Noise level (dB A)				[Sensitive Area] Daytime: 55 dBA Nighttime: 45 dBA [Mixed Area] Daytime: 65 dBA Nighttime: 55 dBA Maximum value allowed in workplace at any point of time is 75 dB(A)	[Sensitive Zone] Daytime: 55 dBA Nighttime: 45 dBA [Industrial zone] Daytime:70 dBA	

*Note: * = National standard for ambient air quality (NEC,2020)*
*Note: ** = IFC/WB Guideline*

(e) Biodiversity

Flora and fauna

- Monitoring item: Plant species and distribution before and during construction of the Tower, and behavior of animal species.
- Record: At any time after the start of construction, the occurrence of plant and animal species will be observed at project area and its surrounding area (500m on one side (1,000m on both sides) across the center of the T/L, covering from the starting point (SS) to the end point (HPP)).

Date	Point	Monitoring item	Status during the reporting period.
		Number of Plant species and distribution	
		Behavior of Animal species -Breeding action, -Nidification action, -Predation (fellow species) action, -Territorial dispute)	

(f) Land acquisition and resettlement

Land Compensation and Replacement

- Monitoring item: Land Compensation, Replacement and Crop Compensation
- Record: PAPs provided with Land Replacement, Land Compensation and Crop Compensation.

SN	Progress Indicator	Frequency
1	Number of affected HHs losing land been compensated (cash) for Land	monthly
2	Number of affected HHs provided land replacement	monthly
3	Number of affected HHs provided with Crop Compensation (cash)	monthly

(g) Labour Environment

- Monitoring item: Workplace Accident, Functional Toilets and Water Accessibility.

Date	Point	Monitoring item	Status during the reporting period.
		Workplace Accident	Number of Accidents / Type of Accident / Action Taken
		Are there toilets which are in working condition?	
		Do the workers have access to potable water and enough water for their use?	

(h) Accident

- Monitoring item: Traffic Accidents of vehicles associated with Project

Date	Monitoring item	Where and How did it occur	Damages caused by accident	Action Taken
	Traffic Accident			

(i) Complaints

i) Natural Environment

- Monitoring item and record: complaints from local government and residents

Date	Item	Complaint by	Complaint details	Action	Remarks (resolution status)

ii) Land Acquisition

- Monitoring item and record: complaints from local government and residents including PAPs on Land Acquisition

Date	Complaint by	Details of Complaint	Action	Remarks (resolution status)

<Operation Phase>

(a) Biodiversity

Flora and fauna

- Monitoring item: ① Plant species which was withered after construction of the Tower and behavior of animal species. ② Number of bird strike and its dead species.
- Record: At any time after the completion of construction, the occurrence of withered plants and animal species will be observed at project area and its surrounding area (500m on one side (1,000m on both sides) across the center of the T/L, covering from the starting point (SS) to the end point (HPP)).

Date	Point	Monitoring item	Status during the reporting period.
		Number of Plant species and distribution	
		Behavior of Animal species -Breeding action, -Nidification action, -Predation (fellow species) action, -Territorial dispute)	
		Dead bird species and number by bird strike	

(b) Accident

- Monitoring item: Traffic Accidents of vehicles associated with Project

Date	Monitoring item	Where and How did it occur	Damages caused by accident	Action Taken
	Traffic Accident			

(c) Complaints

i) Natural Environment

- Monitoring item and record: complaints from local government and residents

Date	Item	Complaint by	Complaint details	Action	Remarks (resolution status)

Appendix 3 : List of floral species recorded in the project area

No	SCIENTIFIC NAME	ENGLISH NAME	DATA SOURCE	CONSERVATION STATUS		SURVEY PERIOD		REMARKS
				IUCN	FNCA 2023	Rainy Season	Dry Season	
1	*Acacia* sp.		Direct observation					
2	*Argyreia* sp.		Direct observation				○	
3	*Acer thomsonii*		Direct observation	LC	S2	○		
4	*Achyranthes aspera*	Prickly Chaff Flower	Direct observation	NL	NL	○	○	
5	*Achyrospermum wallichianum*	Wallich's Achyrospermum	Direct observation	NL	NL	○	○	
6	*Acronychia pedunculata*	Claw Flowered Laurel	Direct observation	LC	NL	○	○	
7	*Actinodaphne* sp.		Direct observation				○	
8	*Aeschynanthus sp*		Direct observation			○	○	
9	*Ageratum conyzoides*	Billygoat Weed	Direct observation	LC	NL	○	○	
10	*Ageretina adenophora*	Mexican Devil	Direct observation	NL	NL	○	○	
11	*Ailanthus integrifolia*	White Siris	Direct observation	LC	S3	○	○	
12	*Alangium chinense*		Direct observation	NL	NL	○	○	
13	*Albizia chinensis*	Chinese Albizia	Direct observation	NL	NL	○		
14	*Albizia gamblei*	Harra siris	Direct observation	NL	NL	○	○	
15	*Albizia lucidior*	Silk Tree	Direct observation	NL	NL	○	○	
16	*Albizia* sp.		Direct observation			○	○	
17	*Alocasia* sp.		Direct observation			○	○	
18	*Alstonia scholaris*	Blackboard Tree	Direct observation	LC	NL	○	○	
19	*Aphanamixis polystachya*	The Pitraj Tree	Direct observation	LC	S3	○	○	
20	*Aphanamixis* sp.		Direct observation			○	○	
21	*Artemisia* sp.		Direct observation			○	○	
22	*Bauhinia purpurea*	Purple Orchid Tree	Direct observation	LC	NL	○	○	
23	*Beaumontia* sp.		Direct observation			○	○	
24	*Bidens pilosa*	Cobblers peg	Direct observation	NL	NL	○	○	
25	*Bombax ceiba*	Red-Silk Cotton Tree	Direct observation	LC	S3	○	○	
26	*Brassaiopsis hainla*		Direct observation	NL	NL	○	○	
27	*Brassaiopsis* sp.		Direct observation			○	○	
28	*Brucea* sp.		Direct observation				○	
29	*Byttneria grandifolia*		Direct observation	NL	NL	○	○	
30	*Calamus erectus*	Viagra Palm	Direct observation	NL	S3	○	○	
31	*Capparis* sp.		Direct observation			○	○	

32	*Carex* sp.		Direct observation			○	○	
33	*Castanopsis indica*	Indian Chestnut	Direct observation	LC	S3	○	○	
34	*Castanopsis* sp.		Direct observation				○	
35	*Celtis tetrandra*	Nilgiri Elm	Direct observation	LC	NL	○	○	
36	*Chisocheton cummingianus*		Direct observation	NL	NL	○	○	
37	*Chomolaena odorata*	Siam Weed	Direct observation	NL	NL	○	○	
38	*Clerodendron* sp.		Direct observation			○	○	
39	*Clerodendrum infortunatum*	Bhant	Direct observation	LC	NL	○	○	
40	*Clerodendrum* sp.		Direct observation			○	○	
41	*Coffea benghalensis*	Bengal Coffee	Direct observation	LC	NL	○	○	
42	*Colebrookea oppositifolia*	Indian Squirrel Tail	Direct observation	LC	NL	○	○	
43	*Combretum* sp.		Direct observation				○	
44	*Commelina diffusa*	Spreading Dayflower	Direct observation	LC	NL	○		
45	*Commelina* sp.		Direct observation			○	○	
46	*Cordia* sp.		Direct observation			○	○	
47	*Crassocephalum crepidioides*	Thickhead	Direct observation	NL	NL	○		
48	*Croton* sp.		Direct observation			○	○	
49	*Dalbergia* sp.		Direct observation				○	
50	*Dendrobium fimbriatum*	The Fringe-Lipped Dendrobium	Direct observation	NL	NL	○	○	
51	*Dendrocalamus hamiltonii*	Hamilton's Bamboo	Direct observation	NL	NL	○	○	
52	*Dicliptera bupleuroides*	Thorowax Foldwing	Direct observation	NL	NL	○	○	
53	*Drymaria cordata*	West Indian Chickweed	Direct observation	NL	NL	○	○	
54	*Elatostema* sp.		Direct observation			○	○	
55	*Engelhardia spicata*	Green Malay Beam	Direct observation	LC	S3	○	○	
56	*Erythrina indica*	Indian Coral Tree	Direct observation	NL	NL	○	○	
57	*Erythrina sp*		Direct observation			○		
58	*Erythrina stricta*	Upright Coral Tree	Direct observation	NL	NL		○	
59	*Ficus cunia*	The Drooping Fig	Direct observation	LC	S3	○		
60	*Ficus roxburghii*	Broad-Leaf Fig	Direct observation	NL	S3	○		
61	*Ficus* sp.		Direct observation			○	○	
62	*Fraxinus* sp.		Direct observation			○	○	
63	*Gordonia excelsa*		Direct observation	NL	NL	○	○	
64	*Gynocardia* sp.		Direct observation			○	○	
65	*Helicia nilagirica*		Direct observation	LC	NL	○	○	
66	*Heteropanax* sp.		Direct observation			○	○	
67	*Heynea trijuga*	Coral Plant	Direct observation	LC	NL	○	○	
68	*Holarrhena antidysenterica*	Conessi Tree	Direct observation	NL	NL	○	○	

69	*Jasminum* sp.		Direct observation			○	○	
70	*Lantana camara*	Tick Berry	Direct observation	NL	NL	○	○	
71	*Lindera* sp.		Direct observation			○	○	
72	*Litsea* sp.		Direct observation			○	○	
73	*Macaranga peltata*	Peltata Macaranga	Direct observation	NL	NL		○	
74	*Maesa chisia*	Chisia Maesa	Direct observation	NL	NL		○	
75	*Magnolia hodgsonii*	Hodsonii's Magnolia	Direct observation	LC	S3	○	○	
76	*Mallotus philippensis*	Red Kamala	Direct observation	LC	NL	○	○	
77	*Mangifera sylvatica*	Himalayan Mango	Direct observation	LC	NL	○	○	
78	*Mikania mikrantha*	Bitter Vine	Direct observation	NL	NL	○	○	
79	*Miliusa* sp.		Direct observation			○	○	
80	*Millettia* sp.		Direct observation			○	○	
81	*Mitragyna speciosa*	Kartom	Direct observation	LC	NL	○	○	
82	*Monosis volkameriifolia*	Volkamer's Monosis	Direct observation	LC	NL	○	○	
83	*Murraya paniculata*	Orange Jasmine	Direct observation	NL	NL	○	○	
84	*Nasturtium* sp.		Direct observation				○	
85	*Oplismenus burmannii*	Basket Grass	Direct observation	NL	NL	○	○	
86	*Oroxylum indicum*	Indian Trumpet Tree	Direct observation	NL	NL	○	○	
87	*Osbeckia sp*		Direct observation			○	○	
88	*Ostodes paniculata*	Panicled Boned Tree	Direct observation	LC	NL	○	○	
89	*Paederia foetida*	Skunk Vine	Direct observation	NL	NL	○	○	
90	*Pandanus furcatus*	Himalayan Screw Pine	Direct observation	EN	NL	○	○	
91	*Parthenocissus* sp.		Direct observation			○	○	
92	*Paspalum conjugatum*	Caraboa Grass	Direct observation	LC	NL	○		
93	*Pentapanax* sp.		Direct observation				○	
94	*Persea lanceolata*		Direct observation	LC	S3	○	○	
95	*Persia* sp.		Direct observation				○	
96	*Phlogacanthus thyrsiformis*		Direct observation	NL	NL	○	○	
97	*Phoebe lanceolata*	Nepali Bonsom	Direct observation	LC	NL	○	○	
98	*Piper pedicellatum*		Direct observation	VN	NL	○	○	
99	*Piper sp*		Direct observation			○		
100	*Poikilospermum* sp.		Direct observation			○	○	
101	*Polianthes* sp.		Direct observation			○	○	
102	*Polyalthia* sp.		Direct observation			○	○	
103	*Pothos cathcartii*	Shaddock	Direct observation	NL	NL	○		
104	*Premna sp*		Direct observation			○		
105	*Psychotria* sp.		Direct observation			○	○	

106	*Pteridium aquilinum*	Bracken	Direct observation	LC	NL	○		
107	*Pteris* sp.		Direct observation				○	
108	*Pterospermum acerifolium*	Bayur Tree	Direct observation	LC	S3	○	○	
109	*Schima wallichii*	Needle Wood Tree	Direct observation	LC	S3	○	○	
110	*Setaria verticillata*	Hooked Bristle Grass	Direct observation	NL	NL	○		
111	*Sida acuta*	Common Wireweed	Direct observation	NL	NL	○	○	
112	*Solanum nigrum*	Black Nigth Shade	Direct observation	NL	NL	○		
113	*Solanum torvum*	Turkey Berry	Direct observation	NL	NL	○		
114	*Solanum viarum*	Tropical Soda Apple	Direct observation	LC	NL		○	
115	*Spermacoce latifolia*	Dropseed	Direct observation	NL	NL	○		
116	*Stephanotis volubilis*		Direct observation	NL	NL	○	○	
117	*Stereospermum colais*	Indian Cork Tree	Direct observation	NL	NL		○	
118	*Syzygium* sp.		Direct observation			○	○	
119	*Tabernaemontana divaricata*	Crape Jasmine	Direct observation	LC	NL	○	○	
120	*Talauma hodgsonii*	Large-Leaf Magnolia	Direct observation	NL	NL	○		
121	*Tetrameles nudiflora*	False Hemp Tree	Direct observation	LC	NL	○	○	
122	*Tetrastigma* sp.		Direct observation			○	○	
123	*Thunbergia coccinea*	Scarlet Cock Vine	Direct observation	NL	NL	○	○	
124	*Thunbergia grandiflora*	Bengal Trumpet	Direct observation	NL	NL	○	○	
125	*Thysolaenia latifolia*	Tiger Grass	Direct observation	NL	NL		○	
126	*Tithonia diversifolia*	Tree Marigold	Direct observation	NL	NL	○	○	
127	*Trichosanthes* sp.		Direct observation			○		
128	*Wallichia densiflora*	Himalayan Dwarf Fishtail Palm	Direct observation	NL	NL	○	○	
129	*Wrightia arborea*	Wooly Dyeing Rosebay	Direct observation	LC	NL	○	○	
						112	110	

EN = Endangered; LC = Least Concern; NT = Near Threatened; CE = Critically Endangered; NL = Not Listed

S1 = Schedule I; S2 = Schedule II; S3 = Schedule III

Appendix 4 : List of Bird species recorded in the project area

No.	SCIENTIFICT NAME	ENGLISH NAME	DATA SOURCE	LIST OF CONSERVATION		SURVEY PERIOD		REMARKS
				IUCN	FNCA	1ST Survey (Rainy Season)	2ND Survey (Dry Season)	
1	*Abroscopus schisticeps*	Black faced warbler	D.O	LC	N/L	○	○	
2	*Acridotheres tristis*	Common Myna	D.O	LC	N/L	○		
3	*Aegithalos concinnus*	Black throated tit	D.O	LC	N/L	○	○	
4	*Alcedo atthis*	Common kingfisher	D.O	LC	S2	○	○	
5	*Alcippe cinerea*	Yellow throated fulvetta	D.O	LC	N/L	○	○	
6	*Anthobaphes violacea*	Orange breasted sunbird	D.O	LC	N/L	○	○	
7	*Anthus rufulus*	Paddy field pipit	D.O	LC	N/L	○	○	
8	*Arachnothera longirostra*	Little Spider hunter	D.O	LC	N/L	○	○	
9	*Ardea intermedia*	Intermediate Egret	D.O	LC	N/L	○		
10	*Argya striata*	Jungle Babbler	D.O	LC	N/L	○		
11	*Bubulcus ibis*	Cattle egret	D.O	LC	N/L	○	○	
12	*Certhia discolor*	Sikkim tree creeper	D.O	LC	N/L	○	○	
13	*Chelidorhynx hypoxantha*	Yellow bellied fantail	D.O	N/L	N/L	○	○	
14	*Chloropsis aurifrons*	Golden fronted leafbird	D.O	LC	N/L	○	○	
15	*Cinnyris asiaticus*	Purple Sundbird	D.O	LC	N/L	○		
16	*Cissa chinensis*	Common green magpie	D.O	LC	N/L	○	○	
17	*Copsychus saularis*	Oriental Magpie Robin	D.O	LC	N/L	○	○	
18	*Coracias benghalensis*	Indian rollar	D.O	LC	N/L	○	○	
19	*Cuculus saturatus*	Himalayan cuckoo	D.O	LC	N/L	○	○	
20	*Culicicapa ceylonensis*	Grey headed Canney flycatcher	D.O	LC	N/L	○	○	
21	*Cyornis poliogenys*	Pale chinned flycatcher	D.O	LC	N/L	○	○	
22	*Dendrocitta formosae*	Grey Treepie	D.O	LC	N/L	○		
23	*Dendrocitta vagabunda*	Rufous treepie	D.O	LC	N/L	○	○	
24	*Dicrurus aeneus*	Bronzed Drongo	D.O	LC	N/L	○	○	
25	*Dicrurus leucophaeus*	Ashy Drongo	D.O	LC	N/L	○		
26	*Dicrurus leucophaeus*	Ashy Drongo	D.O	LC	N/L	○	○	
27	*Enicurus immaculatus*	Black backed forktail	D.O	LC	N/L	○	○	
28	*Enicurus schistaceus*	Slaty-backed forktail	D.O	LC	N/L	○	○	
29	*Erythrogenys erythrogenys*	Rusty Cheeked Scimitar babbler	D.O	LC	N/L	○	○	

30	*Eurocephalus ruppelli*	Northern White-Crowned Shrike	D.O	LC	N/L	○	○	
31	*Gallus gallus*	Red jungle fowl	D.O	LC	S3	○	○	
32	*Garrulax caerulatus*	Grey sided laughingthrush	D.O	LC	N/L	○	○	
33	*Garrulax ruficollis*	Rufous Necked Laughing Thrush	D.O	LC	N/L	○	○	
34	*Gracula religiosa*	Common Hill Myna	D.O	LC	N/L	○	○	
35	*Gracupica contra*	Indian Pied Starling	D.O	LC	N/L	○	○	
36	*Gymnobucco bonapartei*	Grey throated barbet	D.O	LC	N/L	○	○	
37	*Halcyon smyrnensis*	White Breasted kingfisher	D.O	LC	S3	○	○	
38	*Hemixos flavala*	Ashy bulbul	D.O	LC	N/L	○	○	
39	*Hirundo rustica*	Barn Swallow	D.O	LC	N/L	○	○	
40	*Hypsipetes leucocephalus*	Black bulbul	D.O	LC	N/L	○	○	
41	*Lanius schach*	Long tailed shrike	D.O	LC	N/L	○		
42	*Megaceryle lugubris*	Crested Kingfisher	D.O	LC	S2	○	○	
43	*Megalaima asiatica*	Blue throated Barbet	D.O	LC	N/L	○	○	
44	*Megalaima virens*	Great barbet	D.O	LC	N/L	○	○	
45	*Microcarbo niger*	Little cormorant	D.O	LC	S3	○		
46	*Motacilla cinerea*	Grey Wagtail	D.O	LC	N/L	○	○	
47	*Myophonus caeruleus*	Blue whistling thrush	D.O	LC	N/L	○	○	
48	*Oriolus traillii*	Maroon oriole	D.O	LC	N/L	○	○	
49	*Parus cinereus*	Cinereous tit	D.O	N/L	N/L	○	○	
50	*Pavo cristatus*	Peafowl	D.O	LC	S3	○		
51	*Pernis ptilorhynchus*	Oriental Honey Buzzard	D.O	LC	S3	○	○	
52	*Phoenicurus leucocephalus*	White Capped Water Redstart	D.O	LC	N/L	○	○	
53	*Phylloscopus inornatus*	Yellow browed Warbler	D.O	LC	N/L	○	○	
54	*Phylloscopus xanthoschistos*	Grey hooded warbler	D.O	LC	N/L	○	○	
55	*Picus canus*	Grey faced woodpecker	D.O	LC	N/L	○	○	
56	*Pomatorhinus erythrogenys*	Rusty cheeked Scimitar babbler	D.O	LC	N/L	○	○	
57	*Pseudibis papillosa*	Red naped Ibis	D.O	LC	N/L	○		
58	*Psilopogon asiaticus*	Blue throated Barbet	D.O	LC	N/L	○		
59	*Psittacula krameri*	Rose ringed Parakeet	D.O	LC	N/L	○		
60	*Pteruthius rufiventer*	Black-headed shrike-babbler	D.O	LC	N/L	○	○	
61	*Pycnonotus cafer*	Red vented Bulbul	D.O	LC	N/L	○		
62	*Pycnonotus leucogenys*	HImalayan Bulbul	D.O	LC	N/L	○	○	
63	*Rhipidura albicollis*	White throated fantail	D.O	LC	N/L	○	○	
64	*Rhipidura euryura*	White bellied fantail	D.O	LC	N/L	○	○	
65	*Rhyacornis fuliginosa*	Plumbeous Water red start	D.O	LC	N/L	○	○	
66	*Rubigula flaviventris*	Black crested Bulbul	D.O	LC	N/L	○		

67	*Saxicola maurus*	Siberian stone chest	D.O	N/L	N/L	○	○	
68	*Sitta himalayensis*	White tailed nuthatch	D.O	LC	N/L	○	○	
69	*Spilomis cheela*	Crested Serpent Eagle	D.O	LC	S2	○		
70	*Spilornis cheela*	Crested Serpent Eagle	D.O	LC	S2	○	○	
71	*Streptopelia orientalis*	Oriental turtle dove	D.O	LC	N/L	○	○	
72	*Sturnia malabarica*	Chestnut-tailed starling	D.O	LC	N/L	○	○	
73	*Tarsiger hyperythrus*	Rufous breasted bush robbin	D.O	LC	N/L	○	○	
74	*Turdoides striata*	Jungle Babbler	D.O	LC	N/L	○	○	
75	*Urocissa flavirostris*	Yellow billed Blue Magpie	D.O	LC	N/L	○		
76	*Vanellus indicus*	Red Wattled lapwing	D.O	LC	N/L	○	○	
77	*Yuhina nigrimenta*	Blach chinned Yuhina	D.O	LC	N/L	○	○	
78	*Zosterops palpebrosus*	Indian white eye	D.O	LC	N/L	○	○	
						78	62	

LC= Least Concern; EN = Endangered; VU =. Vulnerable; NT =. Near Threatened; N/L = Not Listed; N/C = Not Confirmed
D.O=Direct Observation

Appendix 5 : Total Land Holdings of Project Affected People by Land Acquisition

SN	Gewog	Owner	CID	Land Area Affected (acres)	Total Land Holdings (acres)
1	Trashichhoeling	Tara Man Gurung	11214001868	0.018	16.417
2	Pemaling	Sey Dema	11202000381	0.018	22.032
3	Tendruk	Mumta Rai	11202002102	0.018	8.534

Appendix 6:

Record of Discussions
Public Consultation meeting for proposed Druk Bindu Transmission Line

Date: 18 January 2024
Location: Conference Hall, Gewog Centre, Tendu
Time: 11:00 AM
Participants: See below

Consent for photo, video, and voice recording
Mr. Sangay T. Dorji solicited and received consent of the participants for photo, video and voice recording during the meeting. No objection was raised.

Welcome and Introduction
The meeting was convened by Bhutan Power Corporation (BPC) with support from Tendruk Gewog Administration. Mr. Tshering Dorji, Senior Environment Officer of welcomed the participants and briefly explained the objective and structure of the meeting. The purpose of the meeting was to share information with the sakeholders on:

1. the proposed 68KV transmission line project to evacuate electricity from the proposed Druk Bindu Hydropower project.
2. Environmental and Social Impact Assessment (ESIA) exercise being undertaken by JICA consultants

Accordingly the PCM comprised of three parts

Part I: Presentation on proposed 68KV transmission line project by Mr. Tshering Dorji, Senior Environment Officer of BPC.
PPT was delivered in Lhotshamkha (Nepali language) considerig majority of the participants, especially those likely to be affected by the project, were Nepali speaking Lhotshampas (southern Bhutanese). Main messages delivered during the presentation were:

About the project:

- **Name of Project:** 66 kV Transmission Line (TL) from Proposed Druk Bindu Power House to Jogimara Substation.
- **Places/Corridors:** Tendu, Pemaling (Biru) and Tashicholing (Sipsu), Samtse
- **Length:** Approx. 13.8 km.
- **Numbers of Towers:** Approx. 64 Towers

Aims and Objectives:

- To Evacuate the power generated from the proposed 26MW Druk Bindu Hydropower Power plant.
- Power supply reliability in the Southern region.
- To facilitate and ensure reliability for other development activities in Southern Regions.

Analysis of alternative options

Two alternatives were anlayzed. First Alternative was assessed as having higher social and economic impact. The TL under this option would pass through a number of community forests (CF) and private land. Further, the length of the TL was longer than the second alternative, which would also mean higher cost.

The preferred Alternative

The second alternative is the preferred option owing to lower social impact, shorter distance and associated lower cost of construction. The length of TL falling in different Gewogs, the number of towers falling in State Reserved Forest (SRF) and private lands were presented as below:

SN.	Gewog under Samtse	Approx. Line Length (km)	No. of towers in State forest land (SRFL)	No. of towers in Private Land (PL)
1	Tendu	4.8	22 Towers	0 Tower
2	Pemaling	3	13 Towers	2 Towers
3	Tashichholing	6	23 Towers	4 Towers
	Total	**13.8**	**58 Towers is SRFL**	**6 Towers in Pvt. Land**

He informed that there are a number of land owners under different Gewogs who will be affected by the restrictions associated with 'Right of Way' (ROW), which is essentially the passage that needs to be cleared of vegetation especially during construction and laying of cables. From a total of 37 plots falling in the ROW of the proposed TL, 5 plots are under Tendruk Gewog, 14 in Pemaling Gewog and 17 in Trashichhoeling Gewog would fall in the ROW of proposed TL. In addition to the above private lands, 7200 square meters or 1.78 acres of Orary Community Forest would be affected by the TL. A stretch of CF measuring 18 meters by 400 meters would fall in the ROW of the TL.

He also informed the group that the above information is subject to change based on actual ground situation. Where possible, efforts will be made to minimize impact on private and community forest lands.

Pros and Cons

The stakeholders, especially the owners of private land and CF members, were introduced the pros and cons of the project. The Pros come in the form of benefit to the nation as a whole, enhanced reliability of power supply with minimum blackout, stimulating other development, employment generation and boosting local economy.

The group was also apprised of the Cons that include permanent land change, Loss of Trees, Influx of foreign labors and loss of crops.

The presentation ended with the announcement that each affected landowners will have one to one opportunity to look at the detailed plan.

Land substitution and compensation

In this part of the presentation, Mr. Tshering Dorji explained the circumstances under which affected landowners are eligible for land substitutions and compensations**.** Lands acquired for towers are eligible for substitution if adjacent state land is available. In case of land falling under

ROW, the owners are only eligible for one-time cash compensation for crops damaged or trees removed during construction. The sector representative from the Dzongkhag Administration provided further clarification on compensation.

Part II: Presentation on the ESIA by Mr. Sangay T. Dorji, JICA Consultant

Mr. Sangay introduced the stakeholders to the ongoing Environmental and Social Impact Assessment of project, which he explained is an important regulatory requirement that ensures minimal impact of project activities on social and economic way of life of people and natural environment in the area. He then explained the role of JICA consultants in collecting data and information to identify issues and to propose measures to avoid and mitigate them. The explained in detail the considerations to be made in formulating the project. He explained in detail the following scoping components and parameters for social and environmental considerations:

1. Permits and consultations
2. Pollution control
3. Natural Environment
4. Social Environment
5. Others such as mitigation and monitoring requirements

He also encouraged the participants to take advantage of the ESIA process to voice concerns and share ideas to help avoid and mitigate damages to social and natural environment. He informed them of the upcoming social surveys during which the consultant will interact with the people identified to be affected by construction activities.

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Part III: Question and Answer Session

The questions and concerns raised by the participating community members and responses offered by the BPC officials and consultants are summarized below:

Question 1. What happens if the landowner wants to construct house on the land falling in ROW?

Answer: As per existing rules, construction of building is prohibited in land falling under ROW of the TL.

Question 2. In case of need to remove fruit bearing trees such as oranges and beetle nut, will compensation be based on multiple years of lost harvest opportunities in the future?

Answer: Compensation will be based on existing rules, which is a one time assessment of the trees and fruits removed.

Concern:

One participant expressed concern about neighbors blaming the participants for consenting to the proposed plans.

Response: One must understand that every individual in the meeting are participating in their own personal or household capacity. Based on ground situation, other landowners will also be consulted if required. Therefore, One's consent bear no obligation on others to agree to the proposal.

Concluding remarks

Mr. Tshering Dorji invited the affected landowners for detailed review of how the proposed TL alignment will affect the identified plots. He thanked all stakeholder representative and landowners

for their participation. This was followed by review of the TL alignment maps with each member after which members present signed the no-objection form.

Participants

1. Mr. Tshering Dorji, BPC, Thimphu
2. Mr. Uttam Sunar, Head, ESSD, BPC, Samtse Dzongkhag
3. Mr. Phuntsho Wangdi, DoFPS, Tendu Gewog
4. Mr. Pema Norbu, Gewog Adm. Officer, Tendu Gewog
5. Mr. Lekey Tshering, Livestock Extension Officer, Tendu Gewog
6. Ms. Choni Lhamo, Agriculture Extension Officer, Tendu Gewog
7. Mr. Dhan Bdr, Gurung, Mangmi, Tendu Gewog
8. Ms. Deepa Rai, Tshogpa, Tendu Gewog
9. Mr. Ran Bdr. Gurung, Tshogpa, Tendu Gewog
10. Mr. Tek Bdr. Rai, Tshogpa, Tendu Gewog
11. Mr. Lal Bdr. Subba
12. Mr. Maher Man Rai
13. Mr. Jas Lal Rai
14. Mr. Chatra Man Rai
15. Mr. Ram Bdr. Rai

Record of Discussions
Stakeholder Consultation meeting for proposed Druk Bindu Transmission Line

Date: 19 January 2024
Location: Lalit Tshongkhang, Biru, Pemaling Gewog
Time: 10:00 AM
Participants: See below

Consent for photo, video, and voice recording
Mr. Sangay T. Dorji solicited and received consent of the participants for photo, video and voice recording during the meeting. No objection was raised.

Welcome and Introduction
The meeting was convened by Bhutan Power Corporation (BPC) with support from Tendruk Gewog Administration. Mr. Tshering Dorji, Senior Environment Officer of welcomed the participants and briefly explained the objective and structure of the meeting. The purpose of the meeting was to share information with the stakeholders on:

1. the proposed 68KV transmission line project to evacuate electricity from the proposed Druk Bindu Hydropower project.
2. Environmental and Social Impact Assessment (ESIA) exercise being undertaken by JICA consultants

Accordingly the SHM comprised of three parts.

Part I: Presentation on proposed 68KV transmission line project by Mr. Tshering Dorji, Senior Environment Officer of BPC.
PPT was delivered in Lhotshamkha (Nepali language) considering majority of the participants, especially those likely to be affected by the project, were Nepali speaking Lhotshampas (southern Bhutanese). Main messages delivered during the presentation were:

About the project:

- **Name of Project:** 66 kV Transmission Line (TL) from Proposed Druk Bindu Power House to Jogimara Substation.
- **Places/Corridors:** Tendu, Pemaling (Biru) and Tashicholing (Sipsu), Samtse
- **Length:** Approx. 13.8 km.
- **Numbers of Towers:** Approx. 64 Towers

Aims and Objectives:

- To Evacuate the power generated from the proposed 26MW Druk Bindu Hydropower Power plant.
- Power supply reliability in the Southern region.
- To facilitate and ensure reliability for other development activities in Southern Regions.

Analysis of alternative options
Two alternatives were anlayzed. First Alternative was assessed as having higher social and economic impact. The TL under this option would pass through a number of community forests (CF) and

private land. Further, the length of the TL was longer than the second alternative, which would also mean higher cost.

The preferred Alternative

The second alternative is the preferred option owing to lower social impact, shorter distance and associated lower cost of construction. The length of TL falling in different Gewogs, the number of towers falling in State Reserved Forest (SRF) and private lands were presented as below:

SN.	Gewog under Samtse	Approx. Line Length (km)	No. of towers in State forest land (SRFL)	No. of towers in Private Land (PL)
1	Tendu	4.8	22 Towers	0 Tower
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3	Tashichholing	6	23 Towers	4 Towers
	Total	**13.8**	**58 Towers is SRFL**	**6 Towers in Pvt. Land**

He informed that there are a number of land owners under different Gewogs who will be affected by the restrictions associated with 'Right of Way' (ROW), which is essentially the passage that needs to be cleared of vegetation especially during construction and laying of cables. From a total of 37 plots falling in the ROW of the proposed TL, 5 plots are under Tendruk Gewog, 14 in Pemaling Gewog and 17 in Trashichhoeling Gewog would fall in the ROW of proposed TL.

In addition to the above private lands, 7200 square meters or 1.78 acres of Orary Community Forest would be affected by the TL. A stretch of CF measuring 18 meters by 400 meters would fall in the ROW of the TL,

He also informed the group that the above information is subject to change based on actual ground situation. Where possible, efforts will be made to minimize impact on private and community forest lands.

Pros and Cons

The stakeholders, especially the owners of private land and CF members, were introduced the pros and cons of the project. The Pros come in the form of benefit to the nation as a whole, enhanced reliability of power supply with minimum blackout, stimulating other development, employment generation and boosting local economy.

The group was also apprised of the Cons that include permanent land change, Loss of Trees, Influx of foreign labors and loss of crops.

The presentation ended with the announcement that each affected land owners will have one to one opportunity to look at the detailed plan.

Land substitution and compensation

In this part of the presentation, Mr. Tshering Dorji explained the circumstances under which affected land owners are eligible for land substitutions and compensations**.** Lands acquired for towers are eligible for substitution if adjacent state land is available. In case of land falling under ROW, the owners are only eligible for one-time cash compensation for crops damaged or trees

removed during construction. The sector representative from the Dzongkhag Administration provided further clarification on compensation

Part II: Presentation on the ESIA by Mr. Sangay T. Dorji, JICA Consultant

Mr. Sangay introduced the stakeholders to the ongoing Environmental and Social Impact Assessment of project, which he explained is an important regulatory requirement that ensures minimal impact of project activities on social and economic way of life of people and natural environment in the area. He then explained the role of JICA consultants in collecting data and information to identify issues and to propose measures to avoid and mitigate them. The explained in detail the considerations to be made in formulating the project. He explained in detail the following scoping components and parameters for social and environmental considerations:

1. Permits and consultations
2. Pollution control
3. Natural Environment
4. Social Environment
5. Others such as mitigation and monitoring requirements

He also encouraged the participants to take advantage of the ESIA process to voice concerns and share ideas to help avoid and mitigate damages to social and natural environment. He informed them of the upcoming social surveys during which the consultant will interact with the people identified to be affected by construction activities.

Part III: Question and Answer Session

The questions and concerns raised by the participating community members and responses offered by the BPC officials and consultants are summarized below:

Question 1. Will TL construction entail use of explosives?
Answer: No, TL construction will not require use of explosives.

Question 2. How will compensation be made in case of land acquisition?
Answer: As explained earlier, there are two compensation options for land acquired by project. The owner can choose to go for cash compensation or land substitution if there are state land around the plot. Cash compensation will be based on the value of land acquired based on the applicable rates determined by Property Assessment and Valuation Agency (PAVA).

Question 3. What is the compensation rate for 'Doma' (beetlenut) trees?
Answer: Compensation for trees and crops falling in the ROW of the TL will be assessed by teams comprising of District Agriculture Officer, BPC and relevant sector representative.

Question 4. The existing distribution lines are low and risky. How high or low will the transmission lines be?
Answer: The transmission line are much bigger and higher than the distribution lines. The towers will be more than 20 meters high.

Question 5. What are the compensation rules for Community Forest areas falling in ROW?
Answer: Community Forest land falling acquire for tower location are not eligible for substitution. However, trees removed for the purpose of tower location or ROW will be

compensated. A detailed assessment will be carried out by Forest officials to work out the number of trees and volume to be removed. The total amount based on national royalty rates will be paid into the bank account of the CF group.

Question6. Are there opportunities for the community to benefit from access road construction needs of the project?
Answer: The project has no provision to build access road to each tower locations. However it is possible to explore mutually beneficial options. There may be areas feasible for access road construction which would benefit both the project and the community. Such options can be explored at the level of Gewog Administration, BPC and the contractors.

In this context, a special request was made to consider access road from Lamatar to Toribari along traditional route. The Gup shared that the people of Toribari have difficulty marketing their produce owing to the steep terrain. He said that the cost of manual labor, which is charged per kilogram of load, makes it economically unfeasible for marketing agricultural products. He said that public no-objection certificate has also been secured.

Concluding remarks
Mr. Tshering Dorji invited the affected land owners for detailed review of how the proposed TL alignment will affect the identified plots. He thanked all stakeholders representative and landowners for their participation. This was followed by review of the TL alignment maps with each member after which members present signed the no-objection form.

Participants

1. Mr. Tshering Dorji, BPC, Thimphu
2. Mr. Uttam Sunar, Head, ESSD, BPC, Samtse Dzongkhag
3. Mr. Khem Raj Ghalley, Gup, Pemaling Gewog
4. Ms. Dechen Lhamo, Agriculture Extension Officer, Pemaling Geowg
5. Mr. Dewash Gurung, Tshogpa, Pemaling Gewog
6. Dr. Lam Dorji, Centre for Environment and Development
7. Mr. Sangay Thinley Dorji, OPMAC
8. Mr. Deepak Gurung
9. Mr. Lal Bdr. Gurung
10. Mr. Bhim Bdr. Gurung
11. Mr. Aita Raj Rai
12. Mr. Santos Rai
13. Mr. Krishna Bdr. Rai
14. Ms. Lila Prasad Gurung
15. Mr. Amit Gurung
16. Mr. Robin Bhujel
17. Mr. Siva Raj Gurung
18. Mr. Mon Bdr. Gurung
19. Mr. Dal Bdr. Gurung
20. Ms. Bedha Gurung

21. Mr. Jash Bdr. Gurung
22. Mr. Arjun Bdr. Gurung

Record of Discussions
Stakeholder consultation meeting for proposed Jomori-Phuntshothang Transmission Line

Date: 19 January 2024
Location: Meeting hall, Gewog Office, Tashichoeling Gewog, Samtse
Time: 1:00 PM
Participants: See below

Consent for photo, video, and voice recording
Mr. Sangay T. Dorji solicited and received consent of the participants for photo, video and voice recording during the meeting. No objection was raised.

Welcome and Introduction
The meeting was convened by Bhutan Power Corporation (BPC) with support from Tendruk Gewog Administration. Mr. Tshering Dorji, Senior Environment Officer of welcomed the participants and briefly explained the objective and structure of the meeting. The purpose of the meeting was to share information with the stakeholders on:

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10. Others such as mitigation and monitoring requirements

He also encouraged the participants to take advantage of the ESIA process to voice concerns and share ideas to help avoid and mitigate damages to social and natural environment. He informed them of the upcoming social surveys during which the consultant will interact with the people identified to be affected by construction activities.

Part III: Question and Answer Session

There were no questions but concerns were shared by two land owners. The responses offered by the BPC officials and consultants are summarized below:

Concern/ Opinion 1. Ms. Tandin Bidha, owner of plot identified for ROW ahead of Kangduphu (Jogimara) substation opined that she has invested in clearing vegetation as required by authorities. However, the authorities did not penalize those that did not comply.

Concern/ Opinion 2. Mr. Tara Man Gurung, also owner of one of affected lands said that electric poles were placed in the middle of his plot and that he was not consulted.

Response: The above concerns are related to past events and has no relevance to the proposed TL project and therefore not within the scope of the consultation meeting. However, we will consider your concerns related to the proposed TL.

Concluding remarks

Mr. Tshering Dorji invited the affected landowners for detailed review of how the proposed TL alignment will affect the identified plots. He thanked all stakeholders, representatives, and landowners for their participation. This was followed by review of the TL alignment maps with each member after which members present signed the no-objection form.

Participants

1. Mr. Tshering Dorji, BPC, Thimphu
2. Ms. Tashi Lhamo, Asst. Environment Officer, Samtse Dzongkhag
3. Mr. Chador, Land Registrar, Samtse Dzongkhag

4. Mr. Kunzang Peljor, Gup, Tashichholing Gewog
5. Mr. Uttam Sunar, Head, ESSD, BPC, Samtse
6. Dr. Lam Dorji, Centre For Environment and Development
7. Mr. Sangay Thinley Dorji, OPMAC
8. Mr. Taraman Gurung
9. Ms. Tandin Bidha
10. Mr. Ugyen
11. Mr. Sukman Kumal

Appendix 7:

Minutes of 1st National level Stakeholder consultation meeting for proposed Jomori and Druk Bindu Hydropower and Transmission Line Projects

Date: 1 February 2024
Location: Conference hall, Le Meridien Hotel, Thimphu
Time: 09:30 AM
Participants: Listed Below

Welcome and Introduction

The meeting was convened by Druk Green Power Corporation (DGPC) and Bhutan Power Corporation (BPC) and facilitated by Mr. Lam Dorji and Mr. Sangay Thinley, who are consultants with Tokyo Electric Power Company (TEPSCO) and OPMAC Japan. Mr. Lam Dorji welcomed the participants to the meeting. Prior to introducing the meeting objectives and agenda, he sought the consent of the participants for photo and video recording of the meeting sessions and proceedings, which may be used in projects reports and future publications. With no objections raised, the consent of the participants was secured.

Mr. Lam Dorji informed the participants that the Royal Government has requested Japan's overseas development assistance (ODA) loan for development of Jomori and Druk Bindu Hydropower and transmission line projects. In addition to being subject to Bhutan's regulatory requirements for environmental clearance, the projects must also fulfill the requirements of Japanese government to be eligible for ODA loan. This meeting, he said, was the first of the two stakeholder consultation meetings that must be conducted to meet the requirements of Japan International Cooperation Agency (JICA) guidelines for environmental and social considerations The purpose of this meeting was to share information with stakeholders and seek feedback on the scoping items pertaining to proposed Jomori and Druk Bindu Hydropower and Transmission line projects. He urged the participants to share opinions and sectoral concerns if any, for timely integration in the project plans.

The following meeting agenda and schedule was proposed

Sl. No.	Items	Time
1.	Registration of Participants	9:30 AM – 9:50 AM
2.	Opening address by DGPC	9:50 AM – 10:00 AM
3.	Presentation of JICA Guidelines for Environmental and Social Considerations	10:00 AM – 10:15 AM
4.	Overview: Druk Bindu Hydropower project by DGPC and transmission line by BPC	10:15 AM – 10:30 AM
5.	Presentation on scoping for environmental and social impacts by JICA Survey team	10:30 AM – 11:00 AM
	Coffee break	11:00 AM – 11:15 AM
6.	Overview: Jomori Hydropower project by DGPC and Transmission line by BPC	11:15 AM - 11: 45 PM

7.	Presentation on scoping for environmental and social impacts by JICA Survey team	11 :45 AM – 12:30 PM
	Feedback, Q and A and comments	12:30 PM – 12:50 PM
8.	Closing Remarks	12:50 PM – 1:00 PM
9.	Lunch	1:00 PM – 2:00 PM

Opening remarks by Mr. Dhanjit Singer, DGPC

On behalf of DGPC and BPC as proponents of the Jomori and Druk Bindu Hydropower and Transmission Line projects respectively, Mr. Dhanjit Singer welcomed the stakeholders and provided a brief background to the meeting. He informed the meeting about the recent accelerated approach to development of small hydropower projects to meet the increasing domestic demand for electricity. While some of the small hydropower plants are currently under construction, he said that DGPC is seeking Japanese ODA loan for implementation of the proposed Jomori and Druk Bindu hydropower and transmission line projects. Projects financed under Japanese ODA loans are subject to the requirements of JICA guidelines for Environmental and Social Considerations. For this, JICA consultants are helping DGPC and BPC to fill the gaps in information necessary to meet the requirements of the guidelines. The guidelines require two stakeholder consultations to be conducted – the first one at the scoping level and the second one at the point of finalizing the project. He invited the participants to comment and share concerns.

JICA Guidelines for Environmental and Social Considerations by Sangay T. Dorji

Mr. Sangay T. Dorji, consultant with OPMAC Japan made a PowerPoint presentation on JICA Guidelines for Environmental and Social Considerations. The following components and parameters for identification and assessment of likely environmental social impact of the projects were covered:

1. Permits and consultations
2. Pollution control
3. Natural Environment
4. Social Environment
5. Others such as mitigation and monitoring requirements

Detailed presented is provided in Appendix 2.

Question & Answer session

Ms. Tenzin, Department of Service Transport: What is the differences in requirements as per RGOB and JICA Guidelines for social and environmental considerations?

Sangay T. Dorji responded that gap analysis and review is under process. He added that the final report after 2nd SHM will identify the gaps between Bhutan & JICA's guidelines.

Overview of Druk Bindu Hydropower project by Dhanjit Singer, DGPC

Mr. Dhanji Singer of DGPC made a presentation on the Druk Bindu Hydropower Project. The presentation covered:

- Historical background of the project
- the salient features of the Druk Bindu stage I and Druk Bindu stage II

Stage i		Stage II
•Catchment area = Kachin (28 km2), Druk Bindu (53 km2)		•TRC length = 155 m
•Intake RBL= Kachin El. 967.5, Druk Bindu El 962.00		•TRC outfall = El. 615.3 (*Jaldhaka intake El. 610*)
•FSL at desilting basin = El. 960.30		•Net Head: 99 m
•HRP length=3,192.52 m, 2.3 m dia		•Design discharge= 9.36 m3/s
•Steel penstock = 437.54 m, 1.6 m dia		**•Installed capacity= 8 MW (2x 4 MW)**
•Surface powerhouse = 31m x 13m x 20m		**•Firm power = 1.21 MW**
•Machine center line = El. 731.00		**•Design energy = 33.99 GWh**
•TRC outfall = El. 726.00 m		**•PLF = 49%**
•Design head = 218 m		
•Design discharge= 9.36 m3/s		
•Installed capacity= 18 MW (2 x 9 MW)		
•Firm Power = 2.68 MW		
•Design energy = 75.83 GWh		
•PLF = 49%		

- the environmental and social assessments carried out so far and associated biological, physical, socio-economic baseline data
- the land requirement for the project by type and the temporary or permanent nature of use.
- the project financials

Detailed presentation is provided in Appendix 3.

Question & Answer session

Ms. Sonam Wangmo, Bhutan Ecological Society: Are private landowners aware of the plan and will they be compensated?

Tshering Dorji (BPC) responded that that the affected landowners are informed of the plans through the public consultations held at Gewog levels, which also helps minimize project impacts on private lands. BPC in coordination with the JICA consultants has successfully carried out the public consultation meetings and even obtained NOC from the project affected people (PAP). Where acquisition is unavoidable, the landowners have the option of availing land substitution (if adjacent state land is available) or cash compensation as per rules.

Overview of Druk Bindu Transmission Line by Tshering Dorji, BPC

Mr. Tshering Dorji, Senior Environment Officer at BPC made PowerPoint presentation on proposed transmission line for evacuation of hydroelectricity from the Druk Bindu Hydropower plant sites. The presentation covered the following features of the proposed project:

- Name of Project: 66 kV Transmission Line (TL) from Proposed Druk Bindu Powerhouse to Kangduphu (Jogimara) Substation.
- Places/Corridors: Tendu, Pemaling (Biru) and Tashicholing (Sipsu), Samtse
- Length: Approx. 13.8 km.
- Numbers of Towers: Approx. 64 Towers

Project Objectives:

- To Evacuate the power generated from the proposed 26MW Druk Bindu Hydropower Power plant.
- Power supply reliability in the southern Bhutan.
- To facilitate and ensure reliability for other development activities in Southern Regions.

He shared that every effort was being made to cause minimal impact on private lands and community forests. For the proposed transmission line alignment option, the details of state reserve forest and private land under different Gewogs that fall in the right of way or required for location of towers was presented as below:

SN.	Gewogs	Line Length (km)	No. of towers in State forest land (SRFL)	No. of Affected Pvt. Lands	No. of towers in Private Land (PL)
1	Tendu	4.8	22 Towers	5	0 Tower
2	Pemaling	3	13 Towers	14	2 Towers
3	Tashichholing	6	23 Towers	17	4 Towers
	Total	**13.8 km**	**58 Towers**	**36**	**6 Towers**

Presentation of scoping items for natural environment considerations for Druk Bindu HPP by Lam Dorji

Mr. Lam Dorji made a presentation on the scoping items to be considered for assessment of natural environmental aspects of the project. To meet the pollution control and biodiversity conservation needs of the project, specific areas of interest and the stage (pre-construction, construction, and operational) at which impacts from project activities are expected to occur were identified for each impact area. The presentation covered the following categories and associated impact areas:

- Pollution control
    - Air Quality
    - Water Quality
    - Waste
    - Soil quality
    - Noise and Vibration
    - Odor
    - Sediment
- Biodiversity Conservation
    - Protected Areas
    - Biodiversity

Detailed presentation is given in Appendix 4.

Question & Answer session

Ms. Norbu Yangden, (DOFPS): Does the project have measures in place to minimize impacts on species – prevent noise disturbance not just for humans but also for wild animals?
Mr. Lam Dorji responded by saying Yes. He said that every effort is being made to identify the expected impacts from project activities. The scoping items on protected areas and biodiversity conservation allows for such concerns to be addressed. Your concern is well noted and will be addressed in the environmental management plans of the project.

Comment by Ms. Sonam Wangmo: The likely impacts of the project activities on aquatic life was not covered in the presentation- please add this if possible.

Sangay Dorji responded that DGPC has already conducted the aquatic life assessments and whatever Dr. Lam presented is the additional study to what DGPC have conducted.

Comment by Ms. Norbu Yangden (DOFPS): The study should cover the impacts of both flora and fauna by the proposed project and appropriate mitigation measure should be in place to protect these flora and fauna.

Lam Dorji responded that the survey team is compiling the list of flora and fauna in the project area and their conservation status as per IUCN and FNCA are being identified. Impact of the project on the species will be assessed once the list is finalzed.

Ms. Norbu added that the Environmental assessment study should also take into account the water pollution and waste issues from the labour camps because there will be significant disturbances to water bodies and natural environment during the construction phase. She also informed that it is good that the project survey team are considering analyzing the impacts from the Druk Bindu project to the nearby protected areas even if the project is not located in the PA.

Presentation of scoping items for Social considerations for Druk Bindu HPP by Sangay T Dorji

Mr. Sangay T. Dorji presented the scoping items for social considerations as per the JICA guidelines. The framework for social consideration containing information on impacts areas and areas of interest to manage expected social impacts before, during and after construction activities for the proposed Druk Bindu hydropower project was presented:

a. Resettlement and Land Acquisition
b. Ethnic Minorities and Indigenous Peoples
c. Vulnerable Social Groups
d. Living and Livelihood
e. Land use and local resources use
f. Water use
g. Existing infrastructure and Social Services
h. Working conditions (labor environment)
i. Health, Safety and Security of Local Communities (Sanitation)
j. Heritage (Cultural)
k. Landscape (Scenery)

Copy of the presentation is given in Appendix 5.

Question Answer session

Comment and suggestion: Mr. Dhendup Tsheten (Department of Culture and Dzongkha Development, MOHA) appreciated the cultural heritage considerations of the project. He said that Tendu has a large number of cultural heritage sites and suggested that the project refer to the list of important cultural and heritage sites available with his Department. Sangay T Dorji took note of the concern and suggestions, which he said will be attended to during the upcoming field assessment.

Ms. Norbu Yangden (DOFPS) inquired how the project is going to mitigate the community conflict on resource sharing when the project is having influx of labors in the community. Mr. Sangay T Dorji responded that there is a Grievance Redress Mechanism (GRM) in place that will specifically address the community conflicts.

Ms. Norbu also inquired if the JICA guidelines cover the Environment, Health & Safety of the workers. Sangay T Dorji responded that the DGPC, BPC & any project will have a health screening system in place to address such issues.

Mr. Chorten Namgay (Dept. of Law and Order) expressed the need to consider minimizing impacts of Druk Bindu HPP on Jaldaka Power plant located downstream on the international border with India. He also shared a similar concern on the Druk Bindu TL. As the line is passing parallel to India-Bhutan border, he suggested that at least 10m buffer from the International border be maintained for project activities. DGPC and BPC representatives took note of his concerns for planning.

Ms. Tenzin (Department of Service Transport)commented that if the impacts to the existing roads will be assessed during this study as the existing roads and bridges will be impacted by the projects. Sangay T. Dorji responded that this is beyond the scope of this study but we will take note of this comment and reflect in this ESIA. Danjit (DGPC) also added that DGPC has already started to study the carrying capacity of the existing roads and bridges in consultation with the relevant ministries. Discussions are underway to improve the carrying capacity of the existing roads and bridges.

The session on Druk Bindu HPP and TL ended with a coffee break, after which session resumed with presentations on Jomori HPP and TL.

Presentation on proposed 90MW Jomori Hydropower project by Dhanjit Singer, DGPC
Mr. Dhanjit Singer provided an overview of the proposed Jomori Hydropower project. The following aspects of the following were introduced:

- Background and project location
- Alternatives studied
- Project layout and key features
    - Installed Capacity: 90 MW
    - Firm Power: 15.47 MW
    - Design Energy: 367.33 MU
    - Peaking Capacity: 6 hours
- Environment and Social Impact Assessments including information on:
    - Baseline Data on Biological, Physical and Socio-Environment
        - Land Use-Land Cover (Study Area)
        - Physical Environment
        - Socio-economic Environment
- Project schedule and costs

See Appendix 6 for detailed presentation.

Presentation on proposed 132 KV Jomori Transmission Line project by Tshering Dorji, BPC.
Mr. Tshering Dorji, Senior Environment Officer of BPC made a PowerPoint presentation on the the proposed transmission line for evacuation of electricity from the 90MW Jomori hydropower project. He said that the preferred and currently proposed alignment is the result of assessment of the four alternatives i.e., i) First Route (43km) that passes through core zone of Jomotshangkha Wildlife Sanctuary (JWS), ii) 75.5km route passing through Jomotsangkha/Daifam town, iii) Realignment Proposal (38.6km) to bypass JWS but still passing through high forest and rugged and

geologically fragile terrain, and iv) 62km route aligned with buffer zone around existing Phuntshothang - Jomotshangkha national highway. The fourth option with the following details is being proposed for implementation:

Name of Project: 62km 132kV D/C Transmission Line (TL) from Proposed 90MW Jomori Power House to Phuntshothang Substation, S/jongkhar.

Based on this preferred option, the following Gewog-wise details of length of transmission line, number of towers falling in state reserved forest and private lands was presented.

SN.	Gewogs	Line Length (km)	No. of towers in State forest land (SRFL)	No of private Affected Lands	No. of towers in Private Land (PL)
1	Serthi	15.5	42 Towers	37	4 Towers
2	Langchenphu	24.6	47 Towers	12	1 Tower
3	Samrang	8.6	24 Towers	0	0
4	Pemathang	8.1	19 Towers	5	1 Tower
5	Phuntshothang	4.9	19 Towers	9	0
	Total	**61.7 km**	**151 towers is SRFL**	**63 PAP**	**6 towers**

Presentation of scoping items for environmental considerations for Jomori HPP by Lam Dorji

The scoping items for environmental considerations for Jomori HPP was presented by Lam Dorji. He shared that the proximity of the proposed HPP to JWS and the associated transmission line passing through the protected area requires the project to comply with stringent safeguard measures that should be identified, managed, and monitored appropriately at pre-construction, during construction, and post construction operational phases. As presented earlier, the framework containing details of impact areas and areas of interest for pollution control and biodiversity conservation pertaining to Jomori HPP was presented. The detailed contents of the presentation is given in Appendix 4.

Presentation of scoping items for Social considerations for Jomori Hydropower project by Sangay T Dorji

The scoping items for social considerations for Jomori HPP was presented by Sangay T Dorji. Based on the JICA framework for social considerations, the areas of interest to manage expected social impacts before, during, and after construction activities of the project were presented for each of the following impact areas:

a. Resettlement and Land Acquisition
b. Ethnic Minorities and Indigenous Peoples
c. Vulnerable Social Groups
d. Living and Livelihood
e. Land use and local resources use
f. Water use
g. Existing infrastructure and Social Services
h. Working conditions (labor environment)
i. Health, Safety and Security of Local Communities (Sanitation)
j. Heritage (Cultural)
k. Landscape (Scenery)

Comment by Ms. Nima Zangmo (Electricity Regulatory Authority): Ms. Nima informed the gathering that all these assessments are requirements for issue of construction license as per Electricity Act of Bhutan.

Suggestion by Mr. Dhendup Tshering (DCDD, MOHA): Mr. Dhendup suggested that the project proponents refer to the list of cultural heritage sites to assess likely impacts of project on cultural heritage sites.

Comment by Colonel Tshering Dorji (Royal Bhutan Police): Colonel Tshering Dorji acknowledge the role of Royal Bhutan Police in ensure security and safety of the Public. For this, he requested the project authorities to involve the relevant Police stations in the project sites in future consultations.

Concluding remarks

The meeting concluded with vote of thanks by Mr. Dhanjit Singer, DGPC. He thanked all the stakeholders representatives for their active participation in the consultation meeting.

The meeting concluded at 1:00PM. Participants were served with lunch.

Participants of the 1st National level Stakeholder consultation meeting for proposed Jomori and Druk Bindu Hydropower and Transmission Line Projects

Sl. No.	Name	Organization	Email Adress
1	Tenzin Zepen (Surveyor)	Bhutan Power Corporation Ltd.	tenzinzepen@bpc.bt
2	Jaku Gap	Bhutan Power Corporation Ltd.	jakugyaplmt@gmail.com
3	Colonel Tshering Dorji	Royal Bhutan Police	tsheringd@rbp.gov.bt
4	Nima Zangmo, Deputy Executive Engineer	Elecricity Regulatory Authority	nima.zangmo@era.gov.bt
5	Sonam Wangmo, Chief Program Officer	Bhutan Ecological Society	sonamwangmo@bes.org.bt
6	Singye Wangchuk, Asst. Environment Officer	Department of Environment and Climate Change, Ministry of Energy and Natural Resources	singyewangchuk@moenr.gov.bt
7	Tshering Choden	Bhutan Power Corporation Ltd.	tsheringchoden@bpc.bt
8	Ngawang Norbu	Department of Labour, Ministry of Industry Commerce and Employment	nnorbu@moice.gov.bt
9	Tshering Dorji, Sr. Environment Officer	Bhutan Power Corporation Ltd.	tsheringdorji@bpc.bt
10	Leki Tshewang, Program Officer	Bhutan Trust Fund for Environment Comservation	leki@bhutantrustfund.bt
11	Tandin Jamtsho	Druk Green Power Corporation	t.jamtsho3628@drukgreen.bt
12	Sangay Tshering	Druk Green Power Corporation	s.tshering3617@drukgreen.bt
13	Dorji Yangdon	Druk Green Power Corporation	d.yangdon2400@drukgreen.bt
14	Pema Thinley	Department of Energy, Ministry of Energy and Natural Resources	pemathinley1@moenr.gov.bt
15	Tek Bahadur Ghalley	Department of Forest and Park Service, Ministry of Energy and Natural Resources	tbghalley@moenr.gov.bt

16	Dhendup Tshering	Department of Culture and Dzongkha Development, Ministry of Home Affairs	dtshewang@moha.gov.bt
17	Tenzin Wangmo	Department of Surface Transport, Ministry of Infrastructure and Transport	tenzinwangmo@moit.gov.bt
18	Dhajit Singer	Druk Green Power Corporation	d.singer2147@drukgreen.bt
19	Pema Dorji	Druk Green Power Corporation	p.dorji1869@drukgreen.bt
20	Tandin Tshering, Sr. Environment Officer	Druk Hydro Energy Ltd.	t.tshering8040@dhye.bt
21	Yeshi Wangchuk	Bhutan Power Corporation Ltd.	yeshiwgchuk@bpc.bt
22	Chendra Norbu	Department of School Education, Ministry of Education and Skills Development	chendranorbu@moesd.gov.bt
23	Dorji Wangdi	National Land Commission Secretariat	dorjiw@nlcs.gov.bt
24	Chorten Namgay	Department of Law and Order, Ministry of Home Affairs	cnamgyal@moha.gov.bt
25	Norbu Yangdon	Nature Conservation Division, Department of Forest and Park Services, Ministry of Energy and Natural Resources	norbuyangdon@moenr.gov.bt
26	Kunitaka Sakamoto	Tokyo Electric Power Company, Japan	sakamoto.kunitaka@tepsco.jp
27	Fumiyasu Minagawa	Tokyo Electric Power Company, Japan	fumiyasu-minagawa@tepsco.jp
28	Lam Dorji	Centre for Environment and Development	ldorjie@gmail.com
29	Sangay T. Dorji	OPMAC, Japan	sangaytdorji@gmail.com

Minutes of 2nd National level Stakeholder Consultation Meeting for proposed Jomori and Druk Bindu Hydropower and Transmission Line Projects

Date: 17th April 2024
Location: Conference Hall, Tashi Yid-Wong Hotel, Thimphu.
Time: 09:30 AM
Participants: See Participant List.

Welcome and Introduction

The meeting was convened by Druk Green Power Corporation (DGPC) and Bhutan Power Corporation (BPC).

Prior to introducing the meeting objectives and agenda, consent of the participants for photo and video recording of the meeting sessions and proceedings was sought, which may be used in projects reports and future publications. With no objections raised, the consent of the participants was secured.

Mr. Sangay T. Dorji, JICA Survey Team, informed the participants that the Royal Government has requested Japan's overseas development assistance (ODA) loan for development of Jomori and Druk Bindu Hydropower and transmission line projects. In addition to being subject to Bhutan's regulatory requirements for environmental clearance, the projects must also fulfill the requirements of Japanese government to be eligible for ODA loan.

This meeting, he said, was the second of the two stakeholder consultation meetings that must be conducted to meet the requirements of Japan International Cooperation Agency (JICA) guidelines for environmental and social considerations. The purpose of this consultation is to share findings and results of the preparatory study with stakeholders and seek feedback on the results, mitigation and moniroting pertaining to proposed Jomori and Druk Bindu Hydropower and Transmission line projects. He urged the participants to share opinions and sectoral concerns if any, for timely integration in the project plans.

The following meeting agenda and schedule was proposed

Sl. No.	Items	Time
1.	Registration of Participants	9:00 AM – 9:20 AM
2.	Opening address by DGPC	9:20 AM – 9:30 AM
3.	Presentation on Druk Bindu HPP – Results and Mitigation	9:30 AM – 9:45 AM
4.	Presentation on Druk Bindu TL – Results and Mitigation	9:45 AM – 10:00 AM
5.	Q and A	10:00 AM – 10:15 AM
	Coffee break	10:30 AM – 11:00 AM
6.	Presentation on Jomori HPP – Results and Mitigation	11: 00 AM - 11: 25 AM
7.	Presentation on Jomori TL – Results and Mitigation	11 :25 AM – 11:50 AM
8.	Q and A	12:00 PM – 12:30 PM
9.	Closing Remarks	12:30 PM – 12:40 PM

10.	Lunch	12:40 PM – 1:30 PM

Meeting Proceedings:

1. DhyE CEO Opening Remarks:

- The CEO of DhyE initiated the meeting by emphasizing the necessity of starting the small hydro project due to the need to purchase electricity at higher rates from India during winter seasons.
- Highlighted the second phase of the project involving 90MW Jomori, 26MW Druk Bindu, Gamri 54MW, and Begana 25MW.
- Stressed on sourcing main packages internally, while seeking overseas loan and funding for E&M and TL.
- Mentioned the importance of updating the ESIA report to comply with JICA guidelines for availing JICA loan.

2. Presentation of ESIA Reports (Morning Hours: Druk Bindu Projects):

- Mr. Sangay T. Dorji and Dr. Lam presented the ESIA reports for the Druk Bindu Projects.
- No significant impacts on the social front were reported on hydropower, as there was no internal displacement of people and no significant impact on the livelihood of communities.
- It was noted that there was no resettlement in TL projects as well.
- Mitigation and Monitoring plans were also presented.

Q&A Session:

- **Department of Culture:** Bhutan being a country of living culture, has several festivals and celebrations unique to individual local communities, and with projects coming, there is huge risk of cultural dilution and total disappearance of these traditions in the worst case scenario. Therefore, to encourage the local community to protect and continue their cultural tradition, a proper recognition from the Project would play a major role in its protection. This can be done by undertaking measures such as involving project in their local festival or granting leave during their local festival to those local population employed in the project.
- **CEO DHYE Response:** Stated that one to two days of holiday are given during local holidays but not entire days.
- **Department of Law and Order:** Inquired about the permanency of roads and access roads and BPC's acquisition of necessary approvals. He suggested that in cases which are close to the border areas for access road construction, it would be prudent, if permissions and approvals
- BPC responded that all access roads and ropeways required are included in the ESIA report, along with necessary approvals.

3. Presentation on Jomori Projects:

- Mr. Sangay T Dorji and Dr. Lam presented on the Jomori Projects.

- No significant impacts on the social front were reported on hydropower, as there was no internal displacement of people and no significant impact on the livelihood of communities.
- It was noted that there was no resettlement in TL projects as well.
- Mitigation and Monitoring plans were also presented.

Q&A Session:

- **NLCS:** Inquired about allocations/ requirements of land acquisition of state land.
- Mr. Sangay responded that SFL acquisition is estimated and has been included in the ESIA Report.

CEO, DHyE Closing Remarks:

- Highlighted the importance of being mindful of budgetary constraints, noting that the projects are primarily aimed at serving domestic consumers. Addressing public requests for project funding in local area developments, such as waste disposal facilities and blacktopping existing farm roads, may not be feasible in full. While the project may offer partial assistance, it's essential to recognize that the funds are acquired as a loan. Undertaking additional activities would only escalate the loan amount and add pressure to the lender.
- The meeting was concluded at 12:30 PM and all the stakeholders were thanked for taking time to participate in the stakeholder consultation.

Participants of the 2nd National level Stakeholder consultation meeting for proposed Jomori and Druk Bindu Hydropower and Transmission Line Projects

1. Mr. Ugyen Namgyal, CEO, DHyE
2. Mr. Sonam Wangdi, Director, DGPC
3. Mr. Ganesh Pradhan, Senior Surveyor, National Land Commission Secretariat
4. Mr. Chorten Namgey, Officiating Chief Program Officer, Department of Law and Order
5. Ms. Dorji Yangden, Environment Officer, DGPC
6. Mr. Tandin Jamtsho, Environment Officer, DGPC
7. Ms. Nima Zangmo, Dy. Executive Engineer, Electricity Regulatory Authority
8. Mr. Dhanjit Singer, Dy. Executive Engineer, DGPC
9. Mr. Tandin Tshering, Sr. Environment Officer, DHyE
10. Mr. Sangay Tshering, Environment Officer, DHyE
11. Mr. Sonam Tenzin, Assistant Environment Officer, DoECC, MoENR
12. Mr. Tshering Dorji, Environment Officer, BPC
13. Mr. Tenzin Zoepa, Surveyor, BPC
14. Mr. Dendup Tshewang, Department of Culture and Dzongkha Development
15. Mr. Jigme Sonam, Assistant Environment Officer, BPC
16. Mr. Kinga Tenzin, Surveyor, BPC
17. Mr. Kamal Bahun, Surveyor, BPC
18. Mr. Pema Dorji, Sr. Environment Officer, DGPC
19. Colonel Ugyen Wangchuk, Royal Bhutan Police
20. Mr. Kencho Gyeltshen, Licensing Engineer, Electricity Regulatory Authority
21. Ms. Wangmo, Assistant Engineer, Department of Energy
22. Ms. Dechen Wangmo, Engineer, Department of Energy
23. Mr. Chandra Norbu, Assistant Program Officer, Department of School Education
24. Mr. Namgyel Wangdi, Sr. Program Officer, Bhutan Ecological Society
25. Mr. Sakamoto, Survey Team
26. Mr. Minagawa, Survey Team
27. Mr. Takahashi, Survey Team
28. Mr. Wada, Survey Team
29. Ms. Mishima, Survey Team
30. Mr. Dorji, Survey Team
31. Dr. Lam Dorji, Centre for Environment and Development

Appendix 8 : Valuation Form for Land Acquisition and Compensation

Factors to be taken into Account when Determining Compensation Rates for Kamzhing, Chhuzhing and Orchard Land

The following factors shall be taken into account when calculating the rural land compensation rate for all Classes of Land:

1. Distance from the High way / Feeder Road;
2. Water availability on land;
3. Topography of land;
4. Soil In-stability
5. Scenic, cultural and historical value

1. Distance from the Highway / Feeder road:

- The compensation rate shall increase by 15% if the location of the land under assessment is directly connected to highway / feeder road.
- The compensation rate shall increase by 10% if the location of the land under assessment is within half an hour (normal route) by normal walking distance from the nearest highway / feeder road.
- The compensation rate shall increase by 5% if the location of the land under assessment is more than half an hour (normal route) but less than or equal to one hour normal walking distance from the nearest high way / feeder road.
- If the land under assessment is more than 1 hour normal walking distance, there shall be no percentage increase in Compensation rate.

2. Water availability on the land: (water source within 1 km distance at the time of assessment)

- The compensation rate shall reduce by 5% if there is no water at the land under assessment at the time of assessment.

3. Topography of the land:

- The compensation rate shall remain same if the topography is less than 45°.
- The compensation rate shall decrease by 10% if the topography of the land under assessment is more than or equal to 45°.

4. Soil In-stability:

- 10% decrease if land under valuation is unstable, marshy and prone to landslides while rate will remain same should the soil be stable.

5. Scenic, cultural and historical value:

- 5% increase should the land under valuation have scenic cultural and historical significance.

		Agency -					**Valuation Reference No.**
1	Name of owner	:					
2	ID Number	:					
3	Location of land	:					
4	Plot No. / Thram No.	:					
5	Geog						
6	Dzongkhag						
7	Type of Land	Kamzhing		Chhuzhing	Orchard		
8	Total Area (A + B)						
	Area (A) Topg < 45°						
	Area (B) Topg ≥ 45°						
	Class of land	**Class A1**	**Class A**	**Class B**	**Class C**	**Class D**	**Amount (Nu)**
	Distance from MB	**≤ 1 Km**	**≤ 3 Kms**	**3 < L ≤ 6**	**C> 6-9 Kms**	**C> 9 Kms**	
A	**Base Rate (Nu. per decimal) Tick the PAPpropriate class**						
						% Addition	
	Distance from highway / feeder road	Land connected to highway/feeder road			15%		
B1		Land within half an hour walking distance			10%		
		Half hour < Land ≤ 1 hour walking distance			5%		
		More than an hour walking distance			0%		
B2	Water availability	Water availibity within 1 km distance from source			0		
		No Water availibity on land			-5%		
B3	Soil In-stability	Stable land			0		
		Unstable land			-10%		
B4	Scenic, cultural and historical value	Exist			5%		
		Regular			0		
	Adjusted Rate (AR) = A + (B1 + B2 + B3 + B4)						
	TopogrPAPhy (Topg)*	Area (A)			1.00		

		Area (B)			-10.00%		
	Therefore final value of land						
* Land topogrpahy below 45 ° will be at par with the adjusted rate (AR). However, if a parcel or a portion of							
the land is equal to or more than 45°, the land compensation rate will reduce by 10% on pro rata basis.							

Legend for chiwog valuation format				
Land Area (A)	Pertains to land that is less than 45 °			
Land Area (B)	Pertains to land that is equal to or more than 45 °			
MB	Municipal Boundary			
AR	Adjusted Rate			
Topg	TopogrPAPhy			