ENVIRONMENTAL AND SOCIAL MANAGEMENT AND PLANNING FRAMEWORK (ESMPF)

ASSAM INTRA-STATE TRANSMISSION SYSTEM ENHANCEMENT PROJECT (PHASE-II)

Prepared for Asian Infrastructure Investment Bank (AIIB)

Prepared by Assam Electricity Grid Corporation Limited (AEGCL)

JULY, 2024

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Abbreviations

AIIB	:	Asian Infrastructure Investment Bank
AEGCL	:	Assam Electricity Grid Corporation Limited
AERC	:	Assam Electricity Regulatory Commission
AH	:	Affected Household
APCB	;	Assam Pollution Control Board
ASEB	:	Assam State Electricity Board
BPL	:	Below Poverty Line
CEA	:	Central Electricity Authority
CPCB	:	Central Pollution Control Board, Government of India
DC or D/C	:	Double Circuit
DPR	:	Detailed Project Report
EA	:	Executing Agency
EHV	:	Extra High Voltage
EIA	:	Environmental Impact Assessment
ESIA	:	Environmental and Social Impact Assessment
E&S	:	Environment and Social
ESMP	:	Environmental and Social Management Plan
ESMPF	:	Environmental and Social Management Planning Framework
ESP	:	Environmental and Social Policy
FGD	:	Focus Group Discussion
GHG	:	Greenhouse Gas
GRC	:	Grievance Redress Committee
GRM	:	Grievance Redress Mechanism
GoA	:	Government of Assam
GoI	:	Government of India
GSS	:	Grid Sub-station
HTLS	:	High Temperature Low Sag
IA	:	Implementing Agency
IBAT	:	Integrated Biodiversity Assessment Tool
IMD	:	Indian Meteorological Department
IP	:	Indigenous Peoples
INR	:	Indian Rupee
LA	:	Land Acquisition
MoEF&CC	:	Ministry of Environment, Forest and Climate Change
MSL	:	Mean Sea Level
OPGW	:	Optical Power Ground Wire
PAH	:	Project-Affected Household
PAP	:	Project-Affected People
PMC	:	Project Management Consultancy
PMU	:	Project Management Unit
RFCTLARRA	:	Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013
RP	:	Resettlement Plan
RoW	:	Right of Way
RPF	:	Resettlement Planning Framework
SC or S/C	:	Single Circuit
SF6	:	Sulphur Hexafluoride
ST	:	Scheduled Tribe
IPPF	:	Indigenous People Planning Framework
IPP	:	Indigenous People Plan

EXECUTIVE SUMMARY

Assam Electricity Grid Corporation Limited is a vibrant growth-oriented public sector company registered under the 'Company Act, 1956'. It was formed out of the restructured Assam State Electricity Board in 2003 and was notified as the State Transmission Utility (STU). Its core business is to efficiently transport electrical power from electrical power bulkheads to the distribution company networks in the state of Assam. Assam Electricity Grid Corporation Limited inherited 3862 circuit km of EHV lines above 66 kV voltage class and 38 numbers of extra high voltage (EHV) sub-stations having a total transmission capacity of 1636.50 MVA at its birth in 2003.

AEGCL currently operates with a transmission capacity of about 9630 megavolt-ampere (MVA), a line length of 5395.486 kilometres, and 82 no. of substations, which includes 1 no. of 400 kV, 14 no. of 220 kV, and 67 no. of 132 kV substations. Assam Electricity Grid Corporation Limited pledges to deliver electricity efficiently but economically, with safety standards, with commitment to respect environmental, social and heritage issues.

In alignment with the Government of India's pursuit of the Sustainable Development Goal (SDG-7) for "Affordable and Clean Energy for All," the State of Assam is committed to bolstering its power transmission infrastructure. This initiative aims to ensure enhanced availability and accessibility of "Power for All" (PFA). To realize this vision, the Government of Assam (GoA), facilitated by the Government of India (GoI), has devised the "Assam Intra-State Transmission System Enhancement Project (AISTSEP)," supported by the Asian Infrastructure Investment Bank (AIIB). The primary objective of the project is to elevate the power sector within the state, fostering capacity building for sustained long-term development. Addressing transmission network constraints and congestion is central to the project's goals. This involves augmenting transmission line and substation capacity through the establishment of new transmission substations, accompanied by associated transmission lines, and enhancing existing transmission capacity. AISTSEP comprises two phases, Phase I and Phase II, with the anticipated outcome of significantly improving the reliability of the power network through these strategic interventions.

Phase I of the project involves the construction of 10 new substations operating at voltages of 400 kV, 200 kV, and 132 kV, along with the corresponding transmission lines spanning a total length of 332.945 km. Additionally, an existing AEGCL substation (132/33 kV Gohpur) will undergo a conversion from AIS to GIS. As part of this phase, 18 existing substations are slated for upgrades, where aging transformers will be replaced with new units. Furthermore, the project includes the extension of 186 km of transmission lines, involving the restringing of one single circuit (S/C) line and two double circuit (D/C) lines with High Temperature Low Sag (HTLS) conductors. In addition, 636 km of transmission lines will see their ground wires replaced with optical ground wire (OPGW), and there will be a comprehensive upgrade of substation equipment. As of now, Phase I is actively in progress.

Phase-II of the project comprises construction of new 14 nos. of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines. The overall project expenditure amounts to approximately USD 490 million, with AIIB extending financial support of USD 304 million for Phase I and USD 186 million for Phase II. To integrate environmental and social concerns into Phase II of AISTSEP, AEGCL is formulating an Environmental and Social Management Planning Framework (ESMPF).

Phase II of the AISTSE project includes construction of new 14 nos. of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines.

The sub-project details of AISTSEP, Phase – II is as follows:

- 11 Nos of 132/33 GIS substations along with the transmission lines of a total distance of 154 Kms
- 3 Nos of 220/132 KV substations with the transmission lines of 104 Kms stretch.

Policy, Legal and Regulatory Framework

The implementation of AEGCL will be consistent with the national and state regulatory framework and AIIB's ESF. In general, all these sub-projects would result in positive environmental and social impacts. The adverse environmental and social impacts would be minor, temporary, localized, reversible and immitigable. Some important legal and policy provisions of the Government of India (GoI) and GoA are, Environment Protection Act/ Rules 1986, The Forest (Conservation) Act, 1980, Assam Biodiversity Rules 2010, Wildlife Protection (Assam Amendment) Act 2009, The Disaster Management Act 2005 as Assam fall in earth quake Zone5 and has frequent floods, The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013,Right to Information Act 2005, Panchayats (Extension to the Scheduled Areas) Act 1996, Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act, 2013 (POSH Act), The Electricity Act, 2003 and ,The Indian Telegraph Act, 1885 and Govt. of Assam notification on RoW Compensation dated 10th March 2017etc. The permissions and clearances that need to be obtained from competent authorities for sub-projects are for wildlife clearance, mining of minor minerals for construction, for setting up workers' camps, Pollution Under Control certification for vehicles, etc.

AIIB's E&S Framework

AIIB is an international financial organization that provides multilateral financing and investment platform for infrastructure development and enhanced interconnectivity in Asia. AIIB recognizes that Environmental and Social (E&S) sustainability is a fundamental aspect of achieving outcomes consistent with its mandate to support infrastructure development and enhance interconnectivity in Asia. The objective of AIIB's Environmental and Social Policy (ESP) is to facilitate achievement of these development outcomes, through a system that integrates sound E&S management into Projects. The ESP sets forth mandatory E&S requirements for each Project. Environmental and Social Standards (ESSs) include followings,

ESS 1: Environmental and Social Assessment and Management;
ESS 2: Involuntary Resettlement; and
ESS 3: Indigenous Peoples

Potential E&S risk and Impact by ESS

The assessment of potential E&S risk and its impact in general has been provided with an analysis of generic potential direct, indirect/induced, and cumulative impacts to be caused by the project's construction and operation and maintenance stages.

As per AIIB's ESP, the Project categorization process guidelines has provided in the respective chapters. During the development of an Environmental and Social Management Planning Framework (ESMPF) which will be used as a guidance tool during Project implementation, for AEGCL to carry out sub-project specific Environmental and Social Impact Assessment (ESIA) and seek AIIB's approval prior to contractors' mobilization, and to implement the Environmental and Social Management Plan (ESMP), Abbreviated/Resettlement Plans (A/RPs) and Indigenous People Plans (IPPs, if applicable), which are essential instruments to mitigate impacts and enhance sustainability of the Project.

This ESMPF report comprises baseline data on existing conditions of physical, ecological, economic, and social aspects, together with the identified and anticipated E&S impacts and proposed mitigation measures. The proposed sub-project locations were visited to provide the remediation measures for E&S risks in implementation stage. This assessment was conducted based on visited sub-projects sites with clear footprints, to provide the model ESIA, generic ESMP and an RPF for implementation, as well as to clearly guide the further E&S assessment by providing specific guidelines. An Indigenous People's Development Framework (IPDF) is prepared to guide the preparation of IPPs (if applicable) and compliance during Project implementation.

To avoid the potential E&S risks, the proposed sub-project locations were identified avoiding encroachment of environmentally, socially, culturally and archaeologically sensitive areas. Moreover, as a part of the ESMPF report preparation process IBAT study was also conducted to ascertain the impact on Biodiversity.

Framework procedures for E&S management

The sequence of environmental and social procedures and activities followed for identified activities and to be followed for upcoming activities for each sub-project during the preparation of ESIAs and its implementation (a) E&S Screening, b) E&S considerations in project design and analysis of alternatives, c) Usage of Standard ESMPs for Moderate and Low-risk sub-projects, d) E&S Studies for Substantial-risk subprojects 1 – Baseline Data Collection, Impact Assessment, and ESMP, e) Consultations and Disclosure, f) preparation of ESIA/ESMP and RAP and IPP g) Environmental and Social conditions for Bidding Documents and h) Implementation of ESMP, RAP and TDP. The PMU, PMTC, respective PIUs, DMSC and the E&S Staff of PMU and PIUs will be responsible for these. The overall responsibility for ESMP implementation will rest with the PMU/PIU. However, in the construction areas, the Environment, Social Health and Safety (ESHS) staff of the Contractor is responsible for implementing the ESMP, while the environmental and social specialists of the PIU& PMU will be responsible for the monitoring the ESMPs throughout the Project implementation. The ESMPs will be prepared prior to invitation of bids for respective civil works. Compliance monitoring comprises an on-site inspection of the construction activities to verify that measures identified in the ESMP and included in the clauses for contractors are being implemented. The monitoring and reporting requirements are monthly ESHS Monitoring Reports covering all environmental (pollution events), OHS (accidents) and social (SEA/SH complaints) incidents by contractors and Quarterly ESMP Monitoring Reports by PMU to the AIIB.

Stakeholders' consultation

This section outlines the procedure for consulting with stakeholders that must be followed when conducting comprehensive assessments of the project's activities, or as needed. All important parties involved in the project safeguard papers should be consulted at least once during the assessment process by AEGCL through the external consultants. The goals summarizes for the proposed project and ESIA findings ought to be distributed during stakeholder engagement.

Meaningful public participation and community consultations have been taken up as an integral part of E&S assessment process of the project. Focused Group Discussions (FGDs) were conducted with the local community at the locations especially in the proposed new sub-stations sites and its associated lines in different project locations.

Institutional Arrangement including Monitoring

AEGCL has already formed an E&S unit and designated a responsible entity to ensure that mitigation measures are implemented in conjunction with the AIIB project. In this project, the same procedure with its institutional structure will be used. AEGCL will manage the E&S matters through a well designed organizational structure of Project Management Units (PMUs) at the corporate level and Project Implementation Units (PIUs) at the divisional level, supported by the Project Management Consultant (PMC), in order to enable effective implementation of this ESMPF, additional E&S assessments, including contractors and AEGCL, needs to conduct capacity building programme.

Monitoring

The concurrent internal environmental and social monitoring will be done as part of the regular monitoring by the PMU and PIUs. At the PIUs level, the E&S Experts will oversee the implementation and monitoring of the provisions of ESMF and ESMP. All the sub-projects will be visited at regular intervals (at the minimum on a fortnightly basis) by the E&S Experts of PIUs to check if all environmental and social safeguard requirements are met and to identify any issues that need to be addressed. The E&S Staff of PMU will visit the sub-project sites at least every quarter. The PMU would submit quarterly progress reports to the AIIB on environmental and social management. The PMU will prepare a yearly environmental and social management status report

Resettlement Planning Framework

Prepared specifically for the Project is this Resettlement Planning Framework (RPF). The ESP ESS2, relevant national, state, and international standards for social impact management have all been taken into consideration in the formulation of the framework that follows. The avoidance, minimization, and mitigation principle—which prioritizes minimising adverse societal effects whenever feasible—lays the foundation for the framework.

Grievance Redress Mechanism

A Grievance Redress Mechanism (GRM) will be established immediately to ensure PAPs' and Workers' grievances are addressed in a timely manner. This will include a Grievance Redress Committee (GRC) consisting of representatives from AEGCL, local administration, head of Panchayat, and PAP representative under the chairmanship of project director or its representative. PAPs who believe they have been or are likely to be adversely affected by AIIB's failure to implement the ESP in this Project, can submit their submissions to the AIIB in line with Banks' Policy on AIIB Project-affected People's Mechanism (PPM).

Chapter 1: Introduction & Background

1.1 Project Background and Rationale

Assam Electricity Grid Corporation Limited is a vibrant growth-oriented public sector company registered under the 'Company Act, 1956'. It was formed out of the restructured Assam State Electricity Board in 2003 and was notified as the State Transmission Utility (STU). Its core business is to efficiently transport electrical power from electrical power bulkheads to the distribution company networks in the state of Assam. Assam Electricity Grid Corporation Limited inherited 3862 circuit km of EHV lines above 66 kV voltage class and 38 numbers of extra high voltage (EHV) sub-stations having a total transmission capacity of 1636.50 MVA at its birth in 2003.[1]

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Phase I of the project involves the construction of 10 new substations operating at voltages of 400 kV, 200 kV, and 132 kV, along with the corresponding transmission lines spanning a total length of 332.945 km. Additionally, an existing AEGCL substation (132/33 kV Gohpur) will undergo a conversion from AIS to GIS. As part of this phase, 14 existing substations are slated for upgrades, where aging transformers will be replaced with new units. Furthermore, the project includes the extension of 186 km of transmission lines, involving the restringing of one single circuit (S/C) line and two double circuit (D/C) lines with High Temperature Low Sag (HTLS) conductors. In addition, 636 km of transmission lines will see their ground wires replaced with optical ground wire (OPGW), and there will be a comprehensive upgrade of substation equipment. As of now, Phase I is actively in progress.

Phase-II of the project comprises construction of new 14 nos. of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines. The overall project expenditure amounts to approximately USD 490 million, with AIIB extending financial support of USD 304 million for Phase I and USD 186 million for Phase II. To integrate environmental and social concerns into Phase II of AISTSEP, AEGCL is formulating an Environmental and Social Management Planning Framework (ESMPF).

[1] https://www.aegcl.co.in/company-profile/

[2] https://www.aegcl.co.in/wp-content/uploads/2024/06/070620241713_AEGCL_SUBSTATIONS-1.pdf

1.2 Purpose of ESMPF

The Environmental and Social Management Policy Framework (ESMPF) serves as a strategic policy guide that addresses environmental and social issues and impacts in projects involving programs or series of sub-projects. These impacts are often uncertain until the details of the program or sub-projects are identified. The development of ESMPF aims to provide comprehensive guidelines for conducting Environmental and Social Assessment Studies. The primary goal is to internalize environmental and natural resource considerations, not only to achieve Sustainable Development Goal 7 but also to establish socio-economic safeguards. ESMPF functions as a valuable tool in creating a framework to mitigate or reduce both short-term and long-term environmental and social impacts associated with the construction and maintenance activities of various sub-stations and associated transmission lines under the project. It will guide the utilities in determining the appropriate level of environmental and social assessment required for the sub-projects and in preparing the necessary environmental and social mitigation measures for the sub-projects during the pre-construction, construction, operations and maintenance phases.

Consequently, there is a crucial need for a structured safeguards management approach with a pre-defined framework to mitigate risks. Given that not all project locations and activities have been finalized, the preparation of an Environmental and Social Management Policy Framework (ESMPF) for the project is essential to identify and manage associated environmental risks. The internalization of the ESMPF aims to ensure that activities are assessed and implemented in alignment with the policies of the Government of India (GoI), Government of Assam (GoA), and the Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Policy (ESP) and Environmental and Social Standards (ESSs). This pertains specifically to Phase II subprojects, encompassing 14 new 220kV and 132kV GIS and AIS substations, along with associated transmission lines, and aims to establish a framework based on this comprehensive evaluation.

The ESMPF also serves as a holistic guide for project stakeholders, facilitating environmentally sustainable and climate-resilient development practices (Climate adaptation and mitigation as per CoP 15) in project planning, implementation, and monitoring phases. The project planning, implementation, and monitoring agencies will utilize this ESMPF to conduct project activities in a manner that is both legally compliant and environmentally and socially responsible.

1.3 Objectives of ESMPF

The ESMPF is intended to be primarily based on AIIB's Environmental & Social Policy (ESP) and Environmental & Social Standard (ESS) and Government of India (GoI) and Government of Assam (GoA) legal and regulatory provisions in terms of E&S issues and considerations, their assessment, mitigation, implementation, reporting and monitoring requirements for constructing 14 nos. of new 220 kV and 132 kV GIS and AIS substations and associated transmission lines with the associated infrastructure. The primary objectives of the current assignment are to conduct an environmental and social evaluation, focusing on the potential impacts due to implementation of sub-station construction and associated transmission lines under Phase II of AIIB funded AISTSE project. These objectives encompass:

a) Integrating environmental and social considerations into the identification, design, and implementation of all project interventions, ensuring environmental sustainability and social feasibility.
b) Ensuring the mainstreaming of all relevant environmental and social issues into the design and execution of project activities.

c) Incorporating approaches for the management of Environmental and Social (E&S) risks and impacts across various project aspects, including but not limited to impacts during different phases of project development, involuntary resettlement (livelihoods improvement/restoration issues, temporary and permanent land acquisition, entitlements, and compensation framework), impacts on Indigenous Peoples, occupational and community health and safety, grievance redress mechanism (GRM), and monitoring and evaluation.
d) Establishing procedures for conducting E&S studies to prepare Environmental and Social Impact Assessment/Environmental and Social Management Plan (ESIA/ESMP), Resettlement Planning Framework (RPF) and Indigenous Peoples' Planning Framework (if required) for sub-projects under Phase II.
e) Serving as a tool for specific action plans, programs, policies, standards, and procedures that executing agencies, implementing agencies, consultants, and contractors should adopt and adhere to during project execution and implementation.
f) Ensuring compliance with national laws and regulations, as well as meeting the requirements of the Asian Infrastructure Investment Bank (AIIB).

1.4 Methodology adopted for the development of ESMPF

The methodology involved desk review of secondary information, reconnaissance field visits along with discussion and consultation with various stakeholders and initial screening and scoping to determine the key environmental and social parameters and aspects that are likely to be imparted by the sub-project activities under Phase II of AISTSEP. This ESMPF has been prepared in accordance with all relevant AIIB's Environmental and Social Standards (ESSs), Policies, Guidance Notes, EHS Guidelines (Environmental, Health, and Safety Guidelines) sector guidelines, and the Government of India, Assam State Government relevant regulations, acts, laws, standards and guidelines. The ESMPF preparation process involves identifying and defining risks and impacts, establishing a comprehensive management and mitigation framework, and developing various plans such as ESMPs, Resettlement Planning Framework (RPF), Indigenous Peoples' Planning Framework (IPPF), and Stakeholder Engagement Plan (SEP). Additionally, procedures are outlined to ensure compliance with AIIB's ESF and National/State/Local level rules and regulations including preparation of various environmental and social documents, monitoring mechanisms, disclosure requirements, institutional arrangement and grievance redress. A flow chart of the steps involved in preparation of the ESMPF is provided below in Figure 1**.**

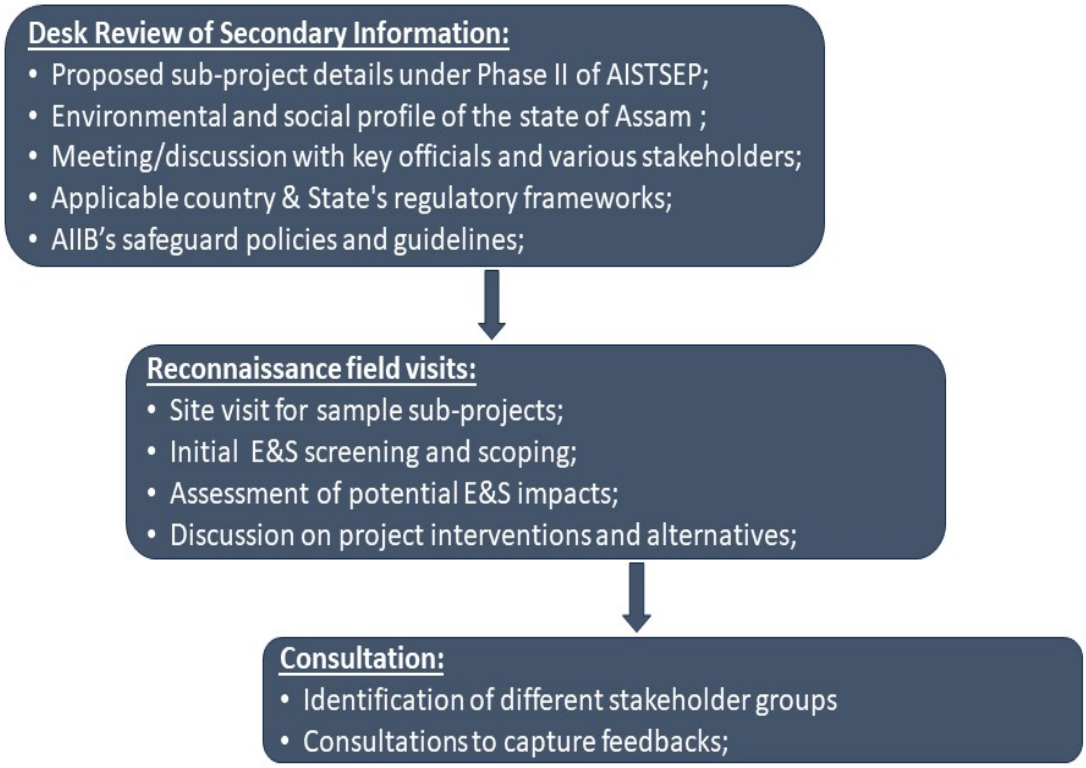


Figure 1 : Steps involved in preparation of the ESMPF

1.5 Structure of the ESMPF

The ESMF report contains the following chapters:

- **Executive Summary**

- **Chapter 1: Introduction and Background**
  This chapter sets the stage for the entire report by providing an introduction to the project and its background. It may include details such as the purpose of the ESMPF and its objectives, and rationale and methodology for developing the ESMPF.
- **Chapter 2: Project Description**
  This chapter delves into the specifics of the project, providing a comprehensive description of its components, activities, and scope. It covers technical details, project timelines, and other relevant information.
- **Chapter 3: Legal and Regulatory Framework**
  This chapter outlines Policies and Regulations of the Governments of Assam and India and the AIIB's Environmental and Social Standards (ESSs) those are relevant to the AISTSEP Phase II.
- **Chapter 4: Description of Environmental & Social Baseline Conditions**
  This chapter details the existing environmental and social conditions in the project area before the implementation of the project. It serves as a baseline against which the impacts of the project can be assessed.

- **Chapter 5: Model ESIA and Environmental and Social Impacts and Mitigation Measures**
  This section identifies potential risks and impacts associated with the project on the environment and social aspects. It also outlines measures to mitigate these risks and minimize adverse effects.
- **Chapter 6: Climate Risk & Vulnerability Assessment**
  The purpose of Climate Risk &vulnerability assessment is to understand the climate and assess climate change threats to the project, to assess the adaptation measures that are proposed in design, to determine to what extent the performance and design is vulnerable to climate change, and to recommend measures that will improve the climate resilience of the project.
- **Chapter 7: Framework Procedures for Environmental & Social Management**
  The chapter describes the overall framework and procedures that will be employed for managing environmental and social aspects throughout the project lifecycle. This includes monitoring, reporting, and evaluation mechanisms.
- **Chapter 8: Stakeholder and Public Consultations and Disclosure of Documentation**
  This chapter outlines the strategies and processes for engaging with stakeholders and the public. It emphasizes transparency and disclosure of relevant project documentation to ensure that all concerned parties are well-informed.
- **Chapter 9: Institutional Arrangements and Capacity Building**
  The chapter addresses the institutional setup and capacity-building measures necessary for effective implementation of the environmental and social management framework. This involves defining roles and responsibilities of various entities involved in the project.
- **Chapter 10: Resettlement Planning Framework**
  This chapter outlines the framework for planning and implementing resettlement activities. It includes measures to minimize adverse impacts on displaced communities/PAFs.
- **Chapter 11: Grievance Redressal Mechanism**
  This chapter establishes a mechanism for addressing grievances and complaints related to the project. It ensures that affected parties have a channel through which they can express concerns and seek resolution.
- **Chapter 12: Indigenous Peoples' Planning Framework**
  This chapter outlines a specific planning framework to address their unique concerns, needs, and rights. It may include measures to preserve and respect indigenous cultures and lifestyles.

Chapter – 2: Project Description

In Phase II of the AISTSE project, the focus is on expanding the state's electricity transmission capacity through the construction of new power sub-stations, associated transmission lines, and complementary infrastructure. The overarching goal is to enhance energy access for industries and businesses while concurrently minimizing transmission losses. The project aims to address the growing demand for electricity, fostering economic development and sustainability. The specific sub-projects detailed in this chapter will provide a comprehensive overview of the proposed construction activities, specifying the locations for new power sub-stations, the routes for associated transmission lines, and the related infrastructure improvements. An integral part of the initiative is the meticulous implementation schedule, ensuring timely and efficient completion of each component. Through these, Phase II endeavours to contribute significantly to the state's energy infrastructure, promoting resilience, reliability, and equitable access to power resources.

2.1 Project Details

Phase II of the AISTSE project includes construction of new 14 nos. of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines.

The sub-project details of AISTSEP, Phase – II is as follows:

- 11 Nos of 132/33 GIS substations along with the transmission lines of a total distance of 154 Kms
- 3 Nos of 220/132 KV substations with the transmission lines of 104 Kms stretch.

The details of the proposed sub-projects and features are provided in **Table 1** and a map depicting the proposed sub-project locations are provided in **Figure 2**.

Table 1 : Details of Proposed subprojects and features under Phase-II AISTSE Project

Sr. No.	Name of Substation and T/L	Name of the Division	District	S/S Land Status	GPS Coordinates	Area (Ha)	Location/ District/ Village/Town	Terrain	Route Length (approx.)
1	New 132/33 kV (2X50 MVA) GIS Substation at Lumding	Samaguri	Nagaon	Govt. land identified and Transferred to AEGCL	25°45'14.38"N 93°08'58.73"E	1.06	Jorangdisha village, Lumding, Nagaon	Hilly (Tila)	-
	132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding								**39.7 Km**
2	New 220/132 kV (2X160 MVA) GIS Substation at Rowta	Depota	Udalguri	AEGCL own land	26°43'25.44"N 92°11'22.17"E	3.89	Rowta, Udalguri	Plain	-
	220kV Rowta (New) - New Rangia (Tamulpur) D/C Line								**69.2 km**
3	New 132/33 kV (2 X 50 MVA) AIS Substation at Agamoni	Dhaligaon/ Salakati	Dhubri	Govt. land identified	26°05'27.5"N 89°50'46.8"E	2.08	DakhinTekrachara Pt-1 village, Agomoni, Dhubri	Plain	-
	132 kV LILO of Gossaigaon - Gauripur S/C (Existing) Line at Agamoni (New)								**10 km**
4	New 220/33 kV (2X100 MVA) GIS Substation at Boragaon (Jalukbari)	Sarusajai	Kamrup	Under Planning	---	---	---	---	-
	220 KV Boragaon (Jalukbari)(New) - Kukurmara (Existing) D/C Line								**21 km**
5	New 220/33 kV (2X100 MVA) GIS Substation at Panjabari	Narengi	Kamrup	Under Planning	---	---	---	---	-
	LILO of 220kV Sonapur-Sarusajai (Existing) -S/C Line at Panjabari								**3 km**
6	New 132/33 kV (2X50 MVA) GIS Substation at Zoo Road	Narengi	Kamrup	Under Planning	---	---	---	---	-
	LILO of 132kV Kahilipara (existing) – Narengi (existing) S/C line at Zoo Road								**8 km**
7	New 132/33 kV (2X 50 MVA) AIS Substation at Serfanguri	Dhaligaon/ Salakati	Kokrajhar	Govt. land identified and Transferred to AEGCL	26°32'44.29"N 90°08'36.37"E	3.36	Coloabari Village, Serfanguri, Kokrajhar	Plain	-
	132kV Serfanguri (New) - Gossaigaon (Existing) D/C Line at Serfanguri								**19.3 Km**
8	New 132/33 kV (2X50	Nagaon	Morigaon	Govt. land	26°28'46.34"N	2.01	Dhing, Nagaon	Plain	-

Sr. No.	Name of Substation and T/L	Name of the Division	District	S/S Land Status	GPS Coordinates	Area (Ha)	Location/ District/ Village/Town	Terrain	Route Length (approx.)
	MVA) AIS Substation at Dhing			identified and Transferred to AEGCL	92°28'13.37"E				
	132kV Dhing (New) - Khaloigaon (Existing) D/C Line								**28.9 km**
9	New 132/33 kV (2X50 MVA) AIS Substation at Udarbond (Silchar-2)	Silchar	Cachar	Tea Estate Land Identified	24°51'04.82"N 92°52'46.52"E	1.48	Arcattypore Tea Estate, Silchar	Hilly (Tila)	-
	LILO of 132KV Pailapool (Existing) -Srikona (Existing) Line at Udarbond								**0.9 km**
10	New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor	Garmur, Jorhat	Jorhat	Tea Estate Land Identified	26°36'58.79"N 94°15'02.20"E	1.21	Letekujan Tea Estate, Titabor, Jorhat	Plain	-
	132kV Titabor (New) - Mariani (Existing) D/C Line								**8.7 km**
11	Establishment of new 132/33 kV (2 X 50 MVA) AIS Substation at Chabua	Tinsukia	Dibrugarh	Tea Estate Land Identified	27°27'56.34"N 95°11'27.57"E	3.62	Chabua Tea Estate, Chabua, Dibrugarh	Plain	-
	LILO of 132 KV Tinsukia (Existing) -Dibrugarh (Existing) S/C Line								**1.4 km**
12	New 132/33 kV (2 X50 MVA) AIS Substation at Morigaon	Narengi	Morigaon	Govt. land identified and Transferred to AEGCL	26°09'19.68"N 92°21'06.36"E	2.07	Morigaon	Plain	-
	132kV Morigaon (New) – Baghjap (Existing) D/c line								**15.6 km**
13	New 132/33 kV (2 X 50 MVA) AIS Substation at Amayapur	Rangia	Nalbari	Private Land Identified	26°20'50.32"N 91°26'48.43"E	2.01	Tormatha, Amayapur, Nalbari	Plain	-
	132kV Amayapur (New) - Hajo (Existing) D/C Line								**25 km**
14	New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara	Mirza	Goalpara	Govt. land identified and Transferred to AEGCL	26°02'01.14"N 91°04'16.10"E	3.36	Dhupdhara, Goalpara	Plain	-
	132kV Dhupdhara (New) - Boko (Existing) D/C Line								**25 km**

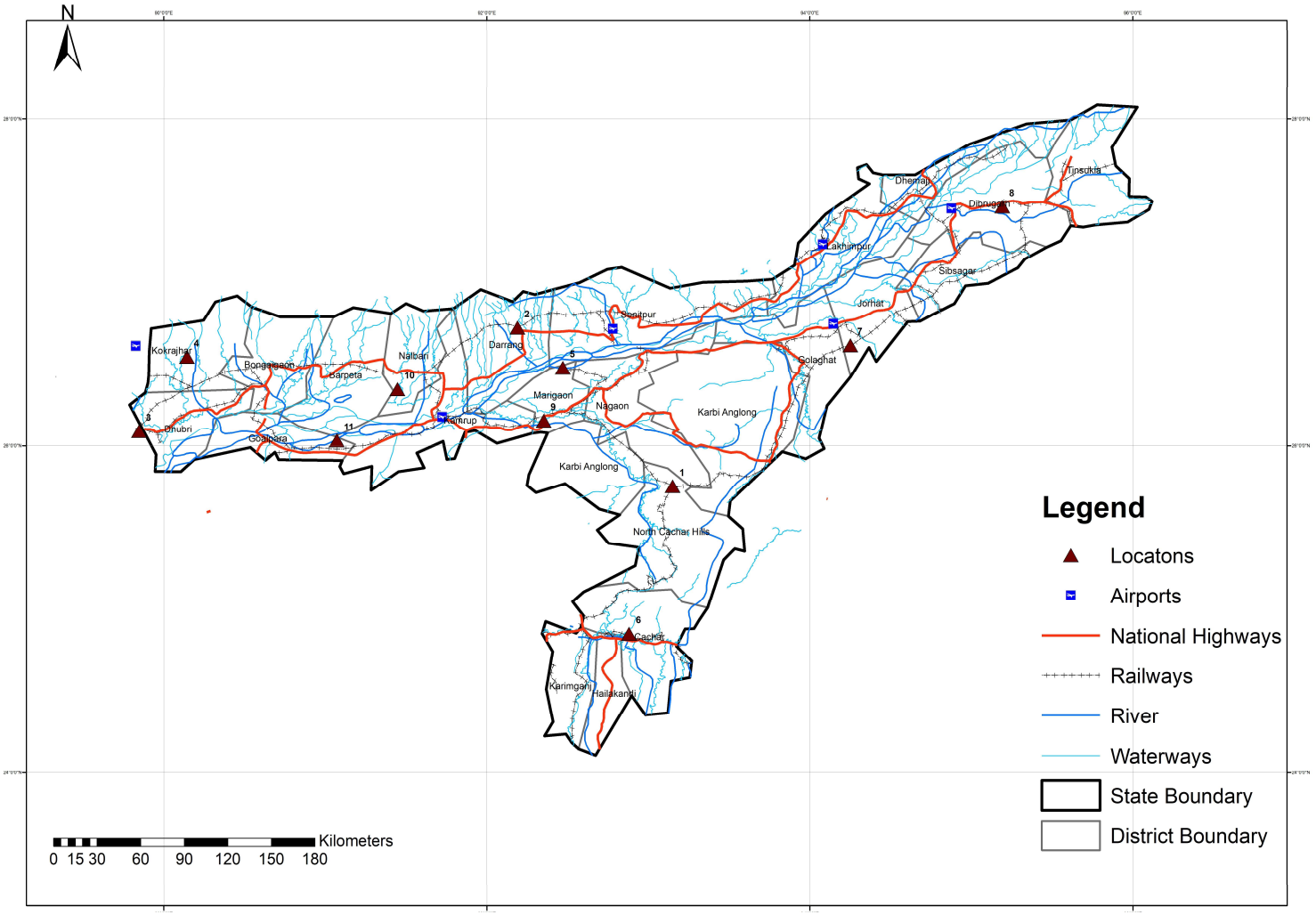


Figure 2 : Proposed sub-project sites under AISTEP, Phase – II

2.2 Sub-project Components

The sub-project components of a proposed Substation and its associated Transmission line is provided below and the rest are provided in **Appendix 1.**

1. **New 132/33 kV (2X50 MVA) GIS Substation at Lumding**

Sl.No	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50 MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132kV D/c line with Single AAAC Panther conductor	39.707 Km	132kV Shankardevnagar (Existing Lumding (New) D/C Line

2.3 Associated Facilities

According to AIIB's Environmental and Social Framework (ESF) 2021, associated facilities refer to activities that are not initially specified in the project's description but are identified as crucial after consultation between the Client and the Bank. These activities are closely linked and materially impactful to the project, either being carried out concurrently with the project or planned to align with its timeline. Their significance lies in their direct contribution to the project's viability; without them, the project would not be feasible. Although not explicitly outlined initially, associated facilities play an integral role in supporting the project's objectives, highlighting their essential nature despite not being initially detailed in the project's description.

The project AISTSEP Phase-II, will focus solely on strengthening the intra-state transmission system of Assam through the construction of new substations and transmission lines and does not encompass any associated facilities. This clarification underscores that the project's scope is limited to enhancing the existing transmission infrastructure without the involvement of ancillary activities deemed directly related or necessary for its viability.

2.4 Project Implementation Schedule of 220/132 kV and 132/33 kV Substations

Sl. No.	Job Description	Time Scale															
		Y0		Y1				Y2				Y3				Y4	
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Land Identification																
2	Environmental and Social Screening and Scoping																
3	Stakeholder and Public Consultation																
4	Forest Clearance (If required)																
5	Land Acquisition (If required)																
6	Land Compensation (If required)																
7	Development of sub-project specific ESIA- ESMP, RAP and TPDP (If applicable)																
8	Invitation of Bid																
9	Opening of Bid and Technical Evaluation																
10	Approval of Technical Evaluation by AEGCL and AIIB																
11	Opening of Price Bid and Evaluation																
12	Approval of Price Evaluation by AEGCL and AIIB																
13	Signing of Contract Agreement																
14	Design/Drawing approval																
15	Civil Works																
16	Testing & Inspection of Equipment																
17	Transportation to Site																
18	Erection of Equipment																
19	Cable laying and Termination																
20	Testing and Commissioning																
21	Monitoring of ESMP Implementation and reporting																
22	Stakeholder and Public Consultation																

Sl. No.	Job Description	Time Scale															
		Y0		Y1				Y2				Y3				Y4	
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
24	Taking over by AEGCL																

2.5 Project Implementation Schedule of associated 220 kV and 132 kV Transmission Lines

Sl. No.	Job Description	Time Scale															
		Y0			Y1				Y2				Y3				Y4	
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Tendering for Route survey, evaluation and award																	
2	Submission and finalisation of the Route Survey Report																	
3	Environmental and Social Screening and Scoping																	
4	Stakeholder and Public Consultation																	
5	Forest Clearance (If required)																	
6	Obtaining RoW permission																	
7	Invitation of Bid																	
8	Opening of Bid and Technical Evaluation																	
9	Approval of Technical Evaluation by AEGCL and AIIB																	
10	Opening of Price Bid and Evaluation																	
11	Approval of Price Evaluation by AEGCL and AIIB																	
12	Signing of Contract Agreement																	
13	Check survey, Route/Alignment and tower design approval																	
14	Testing of Tower (Prototype)																	
15	Sub-project specific ESIA- ESMP, RAP and TPDP (If applicable)																	
16	Payment for Temporary Land use, Zirat/Crop Damage, access road, etc.																	
17	Tower Foundation and other civil works																	
18	Testing of conductor, accessories etc. and transportation																	
19	Erection of Tower																	
20	Stringing of conductor																	

Sl. No.	Job Description	Time Scale																
		Y0			Y1				Y2				Y3				Y4	
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
21	Testing and commissioning																	
22	Monitoring of ESMP Implementation and reporting																	
23	Stakeholder and Public Consultation																	
24	Taking over by AEGCL																	

Chapter 3: Legal and Regulatory Framework

This Chapter outlines and provides a review of existing policies, legislations and regulations. It identifies the requirements that guide the implementation of the ESMPF. There are several Government of India (GoI), Government of Assam (GoA) and International Conventions pertaining to E&S risks and impacts that are relevant to this project. Also, as this Project is being financed by the AIIB, its guidelines are paramount and are discussed. There must be harmony between both sets of frameworks, but should there be any discrepancies between these, the guidelines of the AIIB shall supersede those of the country. Applicable laws, regulations and policies need to be considered for effective management of environmental aspects; including siting criteria, environmental pollution control requirements, needs for institutional mechanisms, occupational and community health and safety requirements, resource utilization, and considerations for cultural and social concerns.

3.1 Constitutional Provisions

The Constitution of India (1950) is rather unique in incorporating certain specific provisions for the protection and improvement of the country's environment. The relevant provisions, introduced by the 42nd Amendment Act, 1976, are given below:

Article 48 A

"The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country".

Article 51 A (g)

"It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures".

Thus, the Indian Constitution includes in the Directive Principles of State Policy a specific directive to the State to protect and improve the environment. At the same time, the Fundamental Duties laid down for all Citizens of the country includes a specific provision to improve and protect the natural environment and to have compassion for the living creatures. Apart from this, the Right to Life guaranteed by Article 21 of the Constitution has been interpreted by the Supreme Court of India in several recent judgements to include the right to live in a clean and healthy environment. This is a very significant development in favour of environment protection.

Similarly, the constitutional provisions in regard to social safeguards are enshrined in the Preamble to the Constitution, such as JUSTICE, social, economic and political; LIBERTY of thought, expression, belief, faith and worship; EQUALITY of status and of opportunity; FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation. Fundamental Rights and Directive Principles guarantee the right to life and liberty. Health, safety and livelihood have been interpreted as part of this larger framework. The provisions on social safeguards are contained in Articles 14, 15, 17, 23, 24, 25, 46, 330, 332, etc.

AEGCL is committed to upholding and implementing the aforesaid constitutional provisions, especially in fulfilling its role and responsibilities in regard to environment and social issues.

Table 2 : Environmental and Social Policies and Regulatory Framework (National and Assam State Regulation)

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
Environmental Regulations				
1.	The Electricity Act, 2003	An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas.	Transmission line projects are constructed under the ambit of Electricity Act, 2003 following the provisions of Section 67 & 68 of act which mandates licensing for the entities involved in the construction, operation and maintenance of the project.	Central Electricity Authority, Regulatory Commissions and establishment
2.	EIA Notification, 2006 and subsequent amendments	EIA notification 2006 and its subsequent amendments lists out type of projects that requires EIA and Environmental Clearance from MoEF&CC or State EIA Authority prior to commencement of any developmental work or project expansion. The notification gives stage-wise guidance for processing of Environmental Clearance.	The construction of substation and Transmission line project does not come under purview EIA Notification 2006 and its subsequent amendments. However, project associated activity like creation of borrow area (if any) for the project will require prior Environmental Clearance.	MoEF & CC or State EIA Authority (SEIAA)
3.	The National Green Tribunal Act, 2010	An act established for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.	Respected to area where development activities may cause any damage to environment and property.	National Green Tribunal (NGT)
4.	Environment Protection Act, 1986 and subsequent amendments and rules Eco-Sensitive Zone Notifications	This Act was introduced as an umbrella legislation that provides a holistic framework for the protection and improvement to the environment the coordination of central and state authorities. Under this Act, rules have been specified for discharge/emission of effluents and different standards for environmental quality. These include Ambient Noise Standard, Mass Emission from Motor	Transmission line projects are non-polluting in nature and do not involve any disposal of solid waste, effluents and hazardous substances on land, air and water, so limited requirements of Environment (Protection) Act, 1986 are applicable (minor to moderate air emission is expected from the project construction phase). None of the project activity falls within declared	MoEF& CC/CPCB Department of Environment and Forest, Assam and MoEF& CC, New Delhi

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
		Vehicles, Mass Emission from construction machineries, General Solid waste and Effluent Standards etc. Regulate certain activities around National Parks and Wildlife Sanctuaries so as to minimise the negative impacts of such activities on the fragile ecosystem encompassing the protected areas. Eco Sensitive Zones have been notified for each National Park and Wildlife Sanctuary.	ESZ. However, any substation and transmission line abutting any ESZ should get prior clearances from relevant forest and wildlife authority.	
5.	The Forest (Conservation) Act,1980 and subsequent amendments and rules	This Act provides for the conservation of forests and regulating diversion of forestlands for non-forestry purposes. When transmission projects fall within forestlands, prior clearance is required from relevant authorities under the Forest (Conservation) Act, 1980. State governments cannot de-reserve any forestland or authorise its use for any non-forest purposes without approval from the Central government. The flow chart for forest clearance as per this law is provided in **Appendix 2.**	Relevance will be depended on the specific sub-project locations and activities proposed	Department of Environment and Forest, Assam, IRO-Guwahati, MoEF& CC
6.	Wildlife Protection Act, 1972 and Subsequent Amendments	The Act provides for the protection of wildlife and for all matters that are connected to wildlife and their habitat. This Act prohibits destruction, exploitation or removal of any wildlife, and provides for protection to listed species of flora and fauna.	Applicability will depend on specific locations of the sub projects. (No sub-project will be located within Wildlife Sanctuary, National Park, wildlife corridors, etc. Hence, wildlife clearance is not required)	Department of Environment and Forest, Assam, NBWL, SBWL
7.	Air (Prevention and Control of Pollution) Act, 1981 and subsequent amendments	This Act establishes ambient air quality standards[3] to provide for the prevention, control and abatement of air pollution.	Relevant, based on the project scale of civil works during construction phase and other ancillary activities (minor to moderate fugitive dust emission is expected).	State Pollution Control Board, Assam. Consent to Establish (CTE) and Consent to Operate (CTO) to be obtained by contractor for operation of

[3]NAAQS is provided in **Table No-14 and Table No-15**

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	The Air (Prevention & Control of Pollution) Assam Rule, 1991			DG sets and procurement of construction materials
8.	Water Prevention and Control of Pollution) Act, 1974 and subsequent amendments The Water (Prevention & Control of Pollution) Assam Rule, 1977	This Act provides water discharge standard[4] applicable to the project for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	Applicable to manage liquid effluent discharges from construction and or from domestic activities	State Pollution Control Board, Assam. Prevention of water pollution due to project activities
9.	Noise Pollution (Regulation and Control Act) 2000 and subsequent amendments	The Rules stipulate ambient noise limits[5] during daytime and night time for industrial, commercial, residential and ecologically sensitive areas. The rules apply both during the construction and operation of the project. Violation of the standards for assessing the noise quality due to the project will lead to penalty as under the EP Act 1986.	Relevant, since minor to moderate noise emission from proposed activities during construction stage like operation of DG sets, construction machineries and vehicles and concrete mixers of applicable ratings	Central Pollution Control Board & State Pollution Control Board, Assam
10.	Biological Diversity Act, 2002 Assam Biodiversity Rules, 2010	The Act provides a comprehensive legal framework for conservation and sustainable use of bio-resources, reflects a strict regime for access, control and benefit sharing. It restricts access and use of biological resources by outsiders and creates decentralized institutional structures (State Biodiversity Boards -SBB and GP level Biodiversity Management Committees) for conservation of biological diversity.	Applicability will depend on specific locations (Sub-Projects) and activities proposed under the project	National Biodiversity Authority (NBA), Assam State Biodiversity Board (ASBB) and Biodiversity Management Committees (BMCs)

[4]The standards are provided in **Appendix 3**

[5]Ambient Quality Standards in respect of noise is provide **in Table 17**

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
11.	Wetland (Conservation and Management) Rules, 2010	Applies to protected wetlands notified under the rules (which include Ramsar sites; wetlands in ESZ/ United Nations Educational, Scientific and Cultural Organization (UNESCO) sites, high altitudes, etc.).	None of the project activity so far falls within declared wetland areas. However, in future if any of the proposed activity falls under the protected wetlands notified, relevant clause of the rules shall be applicable to the project and requisite permission from the given authority will have to be seek	Central Wetlands Regulatory Authority (CWRA)
12.	Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016	Protection to general public against improper handling, storage and disposal of hazardous waste. The rules prescribe the management requirement of hazardous wastes from its generation to final disposal.	Applicable. Used mineral oil generated at the AEGCL substations. AEGCL will seeks authorisation for disposal of hazardous waste from concerned State Pollution Control Board (SPCB), Assam as and when required. The oil can be auctioned to authorised/registered re-refiners and information to the respective SPCB.	State Pollution Control Board, Assam.
13.	Manufacture Storage, & imports of Hazardous Chemicals (MSIHC) Rules, 1989 and subsequent amendments Construction and Demolition Waste Management Rules, 2016	Usage and storage of hazardous substances. The rules provide guidance for safe disposal and management of building materials, debris and rubble resulting from construction, repair, and demolition of any civil structure.	Applicable. Use of SF_6 as insulator in the transformers. Applicable. Construction and demolition waste generated from the project activities shall be managed and disposed as per the rule.	State Pollution Control Board, Assam. State Pollution Control Board, Assam, Local Municipal Board (MCB) and other Local Bodies. Contractor needs to submit plan for reuse or safe disposal.
14.	Solid Waste management Rules, 2016 Plastic waste management Rules, 2016	The rules provide guidance for safe disposal and collection municipal solid waste. The rules provide a regulatory frame work for management of plastic waste generation minimization, source segregation, recycling and disposal effectively.	Applicable. **Applicable to all forms/types of solid waste generated during subproject construction activities** Applicable. Plastic waste generation from proposed subproject activities. Safe disposal as per rules	State Pollution Control Board, Assam and Local Municipal Board (MCB). Contractor needs to submit plans for its safe disposal/burial. State Pollution Control Board, Assam, Local Municipal Board

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
				(MCB) and other Local Bodies.
15.	E-waste Management Rules, 2016	The rules are applicable to the consumers of electrical and electronic equipment. Large consumers of electrical and electronic equipment are required to ensure that e-waste generated by them is channelized through authorized collection centres or service providers to authorized dismantler or recycler. Additionally, records for e-waste are to be maintained for the State Pollution Control Board.	The applicability of the rules is limited to the consumers that generate significant quantities of e-waste	Central Pollution Control Board & State Pollution Control Board, Assam
16.	Batteries (Management and Handling) Rules, 2001	By notification dt. 16th May 2001 under Sections 6, 8 and 25 of the Environment (Protection) Act 1986, the MoEF&CC has put certain restrictions on the disposal and handling of used batteries under this rule.	The applicability of the rules is limited to the consumers	State Pollution Control Board, Assam
17.	Central Motor Vehicle Rules, 1989	To minimize the road accidents, penalizing the guilty, provision of compensation to victim and family and check vehicular air and noise pollution.	Applicable during transportation of manpower and construction material. Also applicable during the use of construction equipment and vehicles.	Commissionerate of Transport (District Transport Offices, Assam)
18.	The Mines and Minerals (Development and Regulation) Act, 1957	For development and regulation of mines and minerals in a sustainable manner. The rules regulate the mining of mineral and dealerships for mining and trading.	Applicable as the construction works shall require stones, aggregates, sand, earth, etc. Permission/consent for mining of minerals (stones, aggregates, sand, earth, etc.) from river beds/ quarries will be provided.	Directorate of Geology and Mining, Assam and Department of Environment and Forest, Assam
19.	Assam Minor Mineral Concession Rules, 2013 and subsequent amendment, 2021	Provide regulations established by state governments or relevant authorities to govern the extraction and management of minor minerals. The amendment prescribes the rates (as per the **3rd schedule**) at which Royalties shall be paid when minor minerals are used or consumed by Government Agencies.	Applicable as the construction works shall require stones, aggregates, sand, earth, etc. Permission/consent for mining of minerals (stones, aggregates, sand, earth, etc.) from river beds/ quarries will be provided and required royalties shall also be paid.	Directorate of Geology and Mining, Assam and Department of Environment and Forest, Assam
20.	National Forest Policy	It articulates the twin objectives of ecological	Applicability will depend on specific locations of	Department of Environment

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	1988	stability and social justice; recognizes people's dependence and their symbiotic relation with forest, emphasizes protection of people's rights over forest resource and offers space for participation of forest dependent communities in the conservation, protection and management of state-owned forests.	sub-projects and activities proposed.	and Forest, Assam, MoEF&CC, New Delhi
21.	Assam Forest Policy, 2004	This policy is to ensure progressive sustainable development of the forests of Assam, to meet the twin objectives of environmental stability and ecological balance together with improved livelihood support system for her people.	Applicability will depend on specific locations of sub-projects and activities proposed.	Department of Environment and Forest, Assam
22.	The Compensatory Afforestation Fund Act, 2016 State Compensatory Afforestation Fund Management and Planning Authority Forest (Conservation) Amendment Rules, 2014	This act provides for the establishment of funds under the public accounts of India and the public accounts of each State and crediting thereto the monies received from the user agencies towards compensatory afforestation, additional compensatory afforestation, penal compensatory afforestation, net present value and all other amounts recovered from such agencies under the Forest (Conservation) Act, 1980. The collected funds will be utilized for afforestation, regeneration of forest system, wildlife protection and infrastructure development	Applicability will depend on specific locations of sub-projects and activities proposed.	Department of Environment and Forest, Assam and MoEF&CC, New Delhi
23.	The Assam Compensatory Afforestation Fund Rules, 1994	Provision to constitute a Fund for the purpose of Compensatory Afforestation to be raised against the Forest Arca diverted for non-forest use under the provisions of Section 4(1) of the Forest (Conservation) Act, 1980	Applicability will depend on specific locations of sub-projects and activities proposed.	Department of Environment and Forest, Assam
24.	Assam (Control of Felling & Removal of trees from Non-Forest Land) Rules 2002 and	These rules prescribe how tree plantations raised in non-recorded forest areas by individuals or institutions are to be governed. They specify which plantations need to be registered, which tree	Applicability will depend on specific locations of subprojects and activities proposed depend on tree cutting requirement in proposed intervention.	Department of Environment and Forest, Assam

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	subsequent amendment	species do not require felling permission, what process is to be followed in order to fell trees outside non recorded forest areas, how is the transit of timber originating from non-recorded forest areas regulated and how and why timber can be confiscated to the Government.		
25.	Disaster Management Act, 2005	This act provides an effective management of disasters and for matters connected therewith or incidental thereto.	The subproject areas fall under the seismic zone V and flood prone zone and hence any construction activities/ interventions will be under purview of this act.	Assam State Disaster Management Authority (ASDMA)
26.	Assam State Disaster Management Policy 2010	The policy provides measures' to be adopted for prevention and mitigation of disaster; mitigation measure to be integrated with development plans and projects; build capacity and preparedness measure; and specify roles and responsibilities to each dept. in relation to adopted measure.	Applicable for preparedness, response and recovery during all stages of the project implementation for the timely and effective response to disaster.	Assam State Disaster Management Authority (ASDMA)
27.	Energy Conservation Act, 2001	This act provides for efficient use of energy and its conservation and for matters connected therewith or incidental thereto.	Applicable all project activities involve use of energy efficient equipment, energy conservation buildings, etc	Inspectorate of Electricity (IEC), Assam
28.	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	This international convention, to which India is a signatory category, lists the endangered flora and fauna and regulates trade of these species.	Though Project Intervention docs not involve any trade of significant Endangered species, yet Environmental safety measures are to be adhered	MoEF&CC, New Delhi and Wildlife Crime Control Bureau (WCCB), Eastern Region, Kolkata
29.	Assam Forest Regulation, 1891	The law relating to Forest, Forest Produces and Duty leviable on timber in Assam.	Applicable if the sub-projects falling under the forest lands and the timber removed, their transit and duty levied.	Department of Environment and Forest, Assam
30.	Assam Joint (People's Participation) Forestry Management Rules, 1998	To support the livelihoods of the Forest Fringe Communities through improved natural resource management with community participation.	Applicable if any joint forest management area got affected due to project activity.	Department of Environment and Forest, Assam

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
31.	The Assam Trees Outside Forest (Sustainable Management Rules), 2022	Provides regulation for Tree Cutting Permission outside forest in a sustainable manner.	Applicable if tree felling requires during the construction of the sub-projects	Department of Environment and Forest, Assam (PCCF, DFO)
32.	National Building Code, 2016	The National Building Code of India (NBC), a comprehensive building Code, is a national instrument providing guidelines. for regulating the building construction activities across the country. The code provides the 'accepted standards' in relation to material specification, testing or other related information. The code provides development control rules and general building requirements (e.g. floor area ratio, specifications on building design, etc.).	Applicable for the construction of Sub-Stations and associated facilities.	Approval building plan From appropriate agency.
33.	Guidelines to Regulate and Control Ground Water Extraction in India, 2019	This act regulates and control ground water extraction for various construction purpose.	Applicable. Proper consent/NOC is required for ground water extraction for sub-project construction activities.	Central Ground Water Board (CGWB)
34.	The Electricity Act, 2003 EIA Notification, 2006 and subsequent amendments	An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas. EIA notification 2006 and its subsequent amendments lists out type of projects that requires EIA and Environmental Clearance from MoEF&CC or State EIA Authority prior to commencement of any developmental work or project expansion. The notification gives stage-wise guidance for processing of Environmental Clearance.	Transmission line projects are constructed under the ambit of Electricity Act, 2003 following the provisions of Section 67 & 68 of act which mandates licensing for the entities involved in the construction, operation and maintenance of the project. The construction of substation and Transmission line project does not come under purview EIA Notification 2006 and its subsequent amendments. However, project associated activity like creation of borrow area (if any) for the project will require prior Environmental Clearance.	Central Electricity Authority, Regulatory Commissions and establishment MoEF&CC or State EIA Authority (SEIAA)

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
35.	The National Green Tribunal Act, 2010	An act established for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.	Respected to area where development activities may cause any damage to environment and property.	National Green Tribunal (NGT)
36.	Environment Protection Act, 1986 and subsequent amendments and rules	This Act was introduced as an umbrella legislation that provides a holistic framework for the protection and improvement to the environment the coordination of central and state authorities. Under this Act, rules have been specified for discharge/emission of effluents and different standards for environmental quality. These include Ambient Noise Standard, Mass Emission from Motor Vehicles, Mass Emission from construction machineries, General Solid waste and Effluent Standards etc.	Transmission line projects are non-polluting in nature and do not involve any disposal of solid waste, effluents and hazardous substances on land, air and water, so limited requirements of Environment (Protection) Act, 1986 are applicable (minor to moderate air emission is expected from the project construction phase).	MoEF& CC/CPCB
Social Regulations				
1.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 Rights of Persons with Disabilities Act, 2016	The act aims to provide fair compensation to landowners and ensure transparency in land acquisition processes. Additionally, it focuses on the rehabilitation and resettlement of affected persons. It gives effect to the proclamation on the full participation and equality of the persons with disabilities and provides the right to equality, life with dignity, and respect for his or her own integrity equally with others.	Yes. Applicable to all sub projects where private land is required to acquire on involuntary basis. Yes. For all the sub-project where Persons with Disabilities are present and affected	State Revenue Department/ District Administration Ministry of Social Justice & Empowerment/ Commissionerate of Labour, Government of Assam
2.	Right to information Act, 2005	The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public	The project activities come under the preview of Right to Information Act and any citizen can obtained any information about any aspect of the	Directorate of Economics and Statistics, Government of Assam

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
		authorities, in order to promote transparency and accountability in the working of every public authority, contain corruption.	project. All documents pertaining to the project would be disclosed to public.	
3.	Forest Right Act, 2006 /Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	This is an act to recognize and vest the forest rights and occupation in forest land in forest dwelling scheduled tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded; to provide for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land. The Act provides for use, access and ownership to forest resources, biodiversity and provision for benefit sharing for ST and other forest dwelling communities.	Applicable in case forest land diversion is required for transmission line constriction.	Department of Environment and Forest, Assam and District Administration
4.	The Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Rules, 1995 Direct Purchase Policy, 2023 The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010 Government of India Act, 1935 (6th Schedule) The Right to Fair	The act provides for specific provisions to prevent atrocities on the Scheduled Castes and the Scheduled Tribes and suggests State Government to frame rules for the same. In the States policy of Direct Purchase of land, the affected land, immovable assets and other assets attached with the land will be evaluated by the District Level Direct Purchase Committee (DLLPC) according to sections 26 to 30 & Schedule I of RFCTLARR Act 2013 along with Multiplication factor of Assam. The land owners will get an incentive of 25%, inclusive of R&R Benefits, on the compensation calculated as per provisions of Section 26 to 30, Valuation of immovable assets & Schedule I of RFCTLARR Act 2013, as he has readily agreed to be a part of the project assets & Schedule I of RFCTLARR Act 2013, as he has readily agreed to	Provides protection to Scheduled Castes and Tribes Prevents atrocities on Scheduled Castes and Tribes Applicable to all sub projects where private land is required to acquire on involuntary basis. This act provides the scope of land purchase without entering into legal hassles from the land holders. The Act is applicable in case the activity supported by the project is planned in close proximity to ancient monuments, archaeological sites and remains. However, the screening process under the ESMF excludes possibility of any activities in the 'prohibited or regulated area' around protected monuments. No notified Archaeological Monuments is located within 300m of the sub project. However, for chance finds the provisions laid out in the act will	District Administration Revenue & Disaster Management (LR) Department, Govt. of Assam Archaeological Survey of India (ASI), GoI District Autonomous council State Revenue Department/ District Administration Ministry of Social Justice & Empowerment/ Commissionerate of Labour, Government of Assam Directorate of Economics and

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	be a part of the project. The Act aims to stop the rampant encroachment and construction around the monuments and other sites of archaeological importance. As per the Act, construction is prohibited in a radius of 100 meters from a protected monument and is regulated in a radius of >100-300 meters from a protected monument. Permission of the National Monuments Authority needs to be taken in case of repair/renovation in the prohibited area or regulated area.	be applicable. This might applicable in the land acquisition process in 6th schedule districts Yes. Applicable to all sub projects where private land is required to acquire on involuntary basis.	Statistics, Government of Assam Department of Environment and Forest, Assam and District Administration
	Rights of Persons with Disabilities Act, 2016		Yes. For all the sub-project where Persons with Disabilities are present and affected	
	Right to information Act, 2005		The project activities come under the preview of Right to Information Act and any citizen can obtained any information about any aspect of the project. All documents pertaining to the project would be disclosed to public.	
	Forest Right Act, 2006 /Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	The Sixth Schedule under Article 244(2) and 275(1) provides for the formation of autonomous administrative divisions — Autonomous District Councils (ADCs) — that have some legislative, judicial, and administrative autonomy within a state[6]	Applicable in case forest land diversion is required for transmission line constriction.	District Administration
	The Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Rules, 1995	The act aims to provide fair compensation to landowners and ensure transparency in land acquisition processes. Additionally, it focuses on the rehabilitation and resettlement of affected persons. It gives effect to the proclamation on the full participation and equality of the persons with disabilities and provides the right to equality, life with dignity, and respect for his or her own integrity equally with others. The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public	Provides protection to Scheduled Castes and Tribes Prevents atrocities on Scheduled Castes and Tribes	

[6]chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mea.gov.in/Images/pdf1/S6.pdf

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
		authority, contain corruption. This is an act to recognize and vest the forest rights and occupation in forest land in forest dwelling scheduled tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights could not be recorded; to provide for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land. The Act provides for use, access and ownership to forest resources, biodiversity and provision for benefit sharing for ST and other forest dwelling communities. The act provides for specific provisions to prevent atrocities on the Scheduled Castes and the Scheduled Tribes and suggests State Government to frame rules for the same.		
5.	Direct Purchase Policy, 2023	In the States policy of Direct Purchase of land, the affected land, immovable assets and other assets attached with the land will be evaluated by the District Level Direct Purchase Committee (DLLPC) according to sections 26 to 30 & Schedule I of RFCTLARR Act 2013 along with Multiplication factor of Assam. The land owners will get an incentive of 25%, inclusive of R&R Benefits, on the compensation calculated as per provisions of Section 26 to 30, Valuation of immovable assets & Schedule I of RFCTLARR Act 2013, as he has readily agreed to be a part of the project assets & Schedule I of RFCTLARR Act 2013, as he has readily agreed to be a part of the project.	Applicable to all sub projects where private land is required to acquire on involuntary basis. This act provides the scope of land purchase without entering into legal hassles from the land holders.	Revenue & Disaster Management (LR) Department, Govt. of Assam
6.	The Ancient	The Act aims to stop the rampant encroachment	The Act is applicable in case the activity supported	Archaeological Survey of

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	and construction around the monuments and other sites of archaeological importance. As per the Act, construction is prohibited in a radius of 100 meters from a protected monument and is regulated in a radius of >100-300 meters from a protected monument. Permission of the National Monuments Authority needs to be taken in case of repair/renovation in the prohibited area or regulated area.	by the project is planned in close proximity to ancient monuments, archaeological sites and remains. However, the screening process under the ESMF excludes possibility of any activities in the 'prohibited or regulated area' around protected monuments. No notified Archaeological Monuments is located within 300m of the sub project. However, for chance finds the provisions laid out in the act will be applicable.	India (ASI), GoI
7.	Government of India Act, 1935 (6th Schedule)	The Sixth Schedule under Article 244(2) and 275(1) provides for the formation of autonomous administrative divisions — Autonomous District Councils (ADCs) — that have some legislative, judicial, and administrative autonomy within a state[7]	This might applicable in the land acquisition process in 6th schedule districts	District Autonomous council
8.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	The act aims to provide fair compensation to landowners and ensure transparency in land acquisition processes. Additionally, it focuses on the rehabilitation and resettlement of affected persons.	Yes. Applicable to all sub projects where private land is required to acquire on involuntary basis.	State Revenue Department/ District Administration
Labour Laws Applicable to Establishments Engaged in Building and Other Construction Work				
1.	Building and Other Construction Workers (Regulation of Employment and Conditions of Service)	It regulates the employment and conditions of service of building and other construction workers and provides for their safety, health and welfare.	Applicable to ensure safety and welfare measures for workers employed at construction sites. License, Safety and welfare measures for work force employed at construction sites are to be regulated in conformity with this act.	Commissionerate of Labour, Government of Assam

[7]chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mea.gov.in/Images/pdf1/S6.pdf

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	Act, 1996			
2.	Workmen Compensation Act, 1923	It provides for payment of compensation by employers to their employees for injury/ fatalities / disablement by accident including occupational disease.	Applicable because contractor shall be applying large number of labours during construction which will include both Men and Women	Commissionerate of Labour, Government of Assam
3.	Employees State Insurance Act, 1948	Employees State Insurance Act provides sickness benefit, maternity benefit (Female employees), disablement benefit, dependent's benefit and medical benefits as specify in the act to the employees.	Applicable because contractor shall be applying large number of labours during construction which will include both Men and Women	Commissionerate of Labour, Government of Assam
4.	The Child Labour (Prohibition & Regulation) Act, 1986 and subsequent Amendments	The Child Labour (Prohibition & Regulation) Act is aimed at regulating the employment of children and prohibiting the engagement of children in certain occupations and processes. It seeks to protect the rights of children and ensure their well-being.	There should not be any child labour (less than 14 years) engaged in any project activity and adolescents (above 14 and less than 18 years) in any hazardous activity.	Commissionerate of Labour, Government of Assam
5.	Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act, 2013 (POSH Act)	The Act is meant to serve as guidelines for the employees subject to the provisions of the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013. It aims to set out effective measures to avoid & to eliminate & if necessary to impose punishment for any sexual harassment in the workplace.	Applicable to all implementing agencies having women workers at project workplaces. It will safeguard and protect women involved in the project from Sexual Harassment.	District Administration
6.	Contract Labour (Regulation & Abolition) Act 1970 along with the rules, 1971	The objective of the Contract Labour Regulation and Abolition) Act, 1970 is to prevent exploitation of contract labour and also to introduce better conditions of work.	Contractors shall employ work-force during Construction. The Act applies to the Principal Employer of an Establishment and the Contractor where in 20 or more workmen are employed or were employed even for one day during preceding 12 months as Contract Labour.	Commissionerate of Labour, Government of Assam
7.	Minimum Wages Act, 1948 along with Central Rules, 1950 The minimum wages	To ensure that workman gets at least minimum wages as fixed by Govt. Minimum wages sets the lowest limit below which wages cannot be allowed to sink.	Applicable because contractor Shall be employing large number of workers during construction.	Commissionerate of Labour, Government of Assam

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	rules Assam 1952			
8.	Payment of Gratuity Act, 1972 The payment of gratuity rules Assam 1972	This act provides for a scheme for the payment of gratuity to employees engaged and completed 5 or more years of service with employer.	Applicable because contractors shall be employing Workman more than 20 persons during Construction Phase.	Commissionerate of Labour, Government of Assam
9.	Employees Provident Fund and Miscellaneous Provision Act, 1952 along with EPF Scheme Rules and Forms	It is a beneficent piece of social welfare legislation aimed at promoting and securing the well-being of the employees.	Applicable because contractors shall be employing Workman more than 20 persons during Construction Phase.	Commissionerate of Labour, Government of Assam
10.	Maternity Benefit Act, 1961 and subsequent amendment, 2017; Assam Maternity benefit Rules 1965	This act provides provision for maternity leave for women, during pregnancy and after giving birth and some other benefits to women employees, in case of medical recommendation of bed rest or miscarriage etc.	Applicable if the contractors shall be employing women workman during Construction Phase. This act safeguards the interest of all women employees and workers engaged under the project.	Commissionerate of Labour, Government of Assam
11.	The Bonded Labour (Abolition) Act 1976 Bonded Labour System (Abolition) Rules 1976	An Act to provide for the abolition of bonded labour system with a view to preventing the economic and physical exploitation of the weaker sections of the people and for matters connected therewith or incidental thereto	Applicable because contractors shall employ numbers of Labours during civil construction. Contractor will ensure that there is no Bonded Labour by him or subcontractors.	Commissionerate of Labour, Government of Assam
12.	Code on Occupational Safety, Health and Working Conditions, 2020	This is a comprehensive code regulating the occupational safety, health and working conditions of the persons employed in an establishment and for matters connected therewith.	Applicable for Occupational Safety, Health and Working Conditions in construction and other works.	Commissionerate of Labour, Government of Assam
13.	National Policy on Safety, Health and Environment at Workplace, 2009	The policy provides an action program for enforcement of national standards on occupational health and safety at construction works, testing and laboratories.	Applicable for ensuring safety of the workforce during the substation/transmission line construction under the project.	-
14.	Equal Remuneration	An Act to provide for the payment of equal	Applicable because contractor shall be applying	Commissionerate of Labour,

Sr. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority
	Act, 1976 along with allied Rules	remuneration to men and women workers and for the prevention of discrimination, on the ground of sex, against women in the matter of employment and for matters, connected therewith or incidental thereto.	large number of labours during construction which will include both Men and Women. Compliance of regulations required.	Government of Assam
15.	Inter-state Migrant Workers Act, 1979	The purpose of this act is to protect workers whose services are requisitioned outside their native states in India. Whenever an employer faces shortage of skills among the locally available workers, the act creates provision to employ better skilled workers available outside the state.	Applicable because contractor shall be employing large number of workers during construction from other States also. Compliance of regulations required.	Commissionerate of Labour, Government of Assam

3.2 International Conventions and Treaties relevance to the project

Table 3: International Labour Law Conventions

Sl. No.	Conventions/Treaties/Declarations	Applicability to the project
A. Nature conservation (Forestry and Wildlife)		
1	Ramsar Convention on Wetlands, 1971	No
2	CITES, 1973 (Convention on International Trade in Endangered Species of Fauna and Flora)	No
3	TRAFFIC, 1976 (The Wildlife Trade Monitoring Network)	No
4	Bonn Convention, 1979 (Convention on the Conservation of Migratory Species)	Yes, Construction of new Transmission Lines may involve specific migratory bird routes
5	CAWT, 2005 (Coalition Against Wildlife Trafficking)	No
6	CBD, 1992 (Convention on Biological Diversity)	No
7	Comission on Sustainable Development, 1992	No
7	ITTA, 1983 (International Tropical Timber Agreement)	No
8	UNFF, 2000 (United Nations Forum on Forests)	No
9	IUCN-World Conservation Union, 1948 (International Union for Conservation of Nature and Natural Resources)	No
10	GTF, 1994 (Global Tiger Forum)	No
B. Hazardous material		
1	Cartagena Protocol on Biosafety, 2003	No
2	Nagoya Protocol, 2010	No
3	SAICM, 2006 (Strategic Approach to International Chemicals Management)	No
4	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	No
5	Basel Convention on the Control of Trans-boundary Movement of Hazardous Waste and Their Disposal, 1989	Yes, Use of Transformer oil
6	Rotterdam Convention on Prior Informed Consent (PIC) for certain Hazardous Chemicals and Pesticides in International Trade, 1998	No
C. Atmospheric emissions		
1	UNFCCC (United Nations Framework Convention on Climate Change), 1992	No
2	Kyoto Protocol, 1997	No
3	UNCCD (United Nations Convention to Combat Desertification), 1994	No
4	Montreal Protocol (on Ozone Depleting Substances), 1987	Yes, Use of SF_6
D. Marine environment		
1.	IWC (International Whaling Commission), 1946	No

The International Labour Organisation (ILO) has ratified six of the eight core / fundamental conventions. A brief description of these International Conventions that the nation is adopted is given in

Table **4.**

Table 4: International Labour Law Conventions

S. No.	International Labour Law Convention	Stipulation/ Terms and Conditions
1	Forced Labour Convention, 1930 (No. 29),	Prohibits all forms of forced or compulsory labour, which is defined as "all work or service which is exacted from any person under the menace of any penalty and for which the said person has not offered himself voluntarily." The convention also requires that the illegal extraction of forced or compulsory labour is punishable as a penal offence and that ratifying states ensure that the relevant penalties imposed by law are adequate and strictly enforced.
2	Abolition of Forced Labour Convention, 1957 (No. 105),	Prohibits forced or compulsory labour as a means of political coercion or education or as a punishment for holding or expressing political views or views ideologically opposed to the established political, social, or economic system; as a method of mobilizing and using labour for economic development; as a means of labour discipline; as a punishment for having participated in strikes; and as a means of racial, social, national, or religious discrimination
3	Equal Remuneration Convention, 1951 (No. 100)	Lays out the principles for equal remuneration for work of equal value and addresses gender discrimination
4	Discrimination (Employment and Occupation) Convention, 1958 (No. 111),	Prohibits all discrimination and exclusion on any basis including of race or colour, sex, religion, political opinion, national or social origin in employment and repeal legislation that is not based on equal opportunities
5	Minimum Age Convention, 1973 (No. 138)	To ensure the effective abolition of child labour and to raise progressively the minimum age for admission to employment or work. India has ratified this convention with a minimum age of 14 years
6	Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour, 1999 (No. 182).	Prohibition and elimination of the worst forms of child labour, including slavery, forced labour and trafficking in human beings. It prohibits the use of children in armed conflicts, prostitution and pornography, illegal activities such as drug trafficking and dangerous work.

3.3 AIIB's Environmental & Social Policies/Directives[8&9]

The AIIB serves as an international financial institution facilitating multilateral financing and investment opportunities aimed at fostering infrastructure development and improving connectivity across Asia. Acknowledging the paramount importance of environmental and social sustainability, the AIIB emphasizes its integral role in achieving goals aligned with its mandate. AIIB's Environmental and Social Framework (**ESF**) supports the Bank's clients in achieving environmentally and socially sustainable development outcomes. It does so by integrating the management of environmental and social risks and impacts into decision-making on, and preparation and implementation of, AIIB-financed projects.

The **ESF** includes an introductory overview, an aspirational Vision Statement, a mandatory Environmental and Social Policy (**ESP**), accompanied by three mandatory Environmental and Social

[8]https://www.aiib.org/en/policies-strategies/_download/environment-framework/AIIB-Revised-Environmental-and-Social-Framework-ESF-May-2021-final.pdf

[9]https://www.aiib.org/en/about-aiib/who-we-are/role-of-law/.content/index/_download/AIIB-Directive-on-the-Environmental-and-Social-Framework-2023.pdf

Standards (**ESSs**) and an Environmental and Social Exclusion List (**ESEL**). The three ESSs comprise: **ESS 1**: Environmental and Social Assessment and Management, **ESS 2**: Land Acquisition and Involuntary Resettlement and **ESS 3**: Indigenous Peoples.

Environmental and Social Policy (ESP) sets forth mandatory E&S requirements for AIIB's investments.

Environmental and Social Standards (ESSs) are designed to help Borrowers (AEGCL) to manage the risks and impacts of a project, and improve their environmental and social performance, through a risk and outcomes-based approach. The desired outcomes for the project are described in the objectives of each ESS is given in **Table 5**, followed by specific requirements to help Borrowers (AEGCL) achieve these objectives through means that are appropriate to the nature and scale of the project and proportionate to the level of environmental and social risks and impacts.

Table 5: Environmental and Social Standards of AIIB

Environmental and Social Standards (AIIB)	Objective & Brief Description
ESS1: Environmental and Social Assessment and Management	ESS1 seeks to guarantee the sustainability and soundness of projects from an environmental and social perspective, as well as to facilitate the incorporation of these factors into the decision-making and execution stages of projects. If the Project is anticipated to have negative social or environmental risks and impacts (or both), then ESS 1 is applicable. The scope of the environmental and social assessment and management measures are proportional to the risks and impacts of the Project. ESS 1 provides for both quality environmental and social assessment and management of risks and impacts through effective mitigation and monitoring measures during the course of Project implementation. The ESS 1 defines the detailed requirements of the environmental and social assessment (including Climate Risk assessment and Greenhouse Gas (GHG) Reporting in line with Paris Agreement 2015, Biodiversity Assessment, Project-level GRMs, Labor Management Relations etc.) to be carried out for any project to be financed by the Bank.
ESS 2: Land Acquisition and Involuntary Resettlement	ESS 2 is applicable if the Project's screening process reveals that the Project would involve Involuntary Resettlement (including Involuntary Resettlement of the recent past or foreseeable future that is directly linked to the Project). Involuntary Resettlement covers physical displacement (relocation, loss of residential land or loss of shelter) and economic displacement (loss of land or access to land and natural resources; loss of assets or access to assets, income sources or means of livelihood) as a result of: (a) involuntary acquisition of land; or (b) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers such displacement whether such losses and involuntary restrictions are full or partial, permanent or temporary. The ESS 2 defined detailed requirements of a plan or framework, as applicable, which may be called a land acquisition and resettlement plan (LARP) or, in the case of a framework, a land acquisition and resettlement planning framework (LARPF)of the projects involving involuntary resettlement.
ESS3: Indigenous Peoples	If there are Indigenous Peoples in the proposed project area or if they have a collective relationship to it and are likely to be impacted by the project, then the ESS 3 is applicable. In general, the phrase "Indigenous Peoples" refers to a unique, vulnerable, social and cultural group that varies in the degree that it possesses the following traits: • Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; • Collective attachment to geographically distinct habitats or ancestral

Environmental and Social Standards (AIIB)	Objective & Brief Description
	territories in the Project area and to the natural resources in these habitats and territories; • Customary cultural, economic, social or political institutions that are separate from those of the dominant society and culture; and • A distinct language, often different from the official language of the country or region. The ESS 3 defined detailed requirements of a plan or framework, as applicable, which may be called an Indigenous Peoples plan (IPP)or Indigenous Peoples planning framework (IPPF), which is provided to the Bank as a freestanding document, an annex to the assessment report, or incorporated as a recognizable element of the report.

Environmental and Social Exclusion List: The Bank will not finance Projects that it determines do not comply with the ESP and applicable ESSs. The Bank will not knowingly finance a Project that: (a) either involves or results in forced evictions; or (b) involves activities or items specified in the list set forth in the Environmental and Social Exclusion List (**Appendix 4**).

3.4 Gap Analysis between National and AIIB Policy and Standards

Some gaps are seen between the AIIB and India's national regulations are given in **Table 6**.

Table 6: Gap Analysis between AIIB's and India's Policies and Standards

Sr. No	Stages of Project	AIIB ESF 2022	National Regulations	Gaps identified
1	Project Screening and Categorization	Analyze potential impacts of the project for Screening of each proposed project at the concept stage Projects categorized as A, B, C and FI.	As per EIA notification 2006, All projects and activities are broadly categorized in to two categories - Category A and Category B, based on the spatial extent of potential impacts and potential impacts on human health, natural and manmade resources. Category A projects are those having significant environmental impact. Category B is divided into two categories B1 and B2 based on the potential impact of project. B1 projects require prior Environmental Clearance from State Environmental Impact Assessment Authority (SEIAA) through recommendations of State Environmental Appraisal Committee (SEAC). B2 projects are those which have no or minimal potential impacts.	Power transmission (and distribution) projects are not listed as environmental sensitive projects under EIA notification 2006 and fall in B2 category. However, the ESS of AIIB lists power transmission projects as projects which may have adverse environmental and social impacts (category B).
2	Conduct Environmental and Social Impact Assessment	Client to undertake an Environmental and Social Assessment of potential physical, biological, Socio-economic and cultural risks and impacts. The type of instrument and level of detail is determined on the basis of project screening and environmental and social categorization. Client to prepare ESIA or ESMP as appropriate	As per EIA notification 2006; **Category A** - Require Prior Environmental Clearance (EC) from Central Government in the MoEF&CC through recommendation of Environmental Appraisal Committee (EAC). **Category B** – It is divided into two categories B1 and B2. **Category B 1** projects require prior Environmental Clearance from State Environmental Impact Assessment Authority (SEIAA) through recommendations of State Environmental Appraisal Committee (SEAC),	As per National regulations/ standards (EIA notification 2006) the substation and transmission line projects fall under B2. Category B2 does not require EIA. Only Forest Clearance is required, in case the transmission lines pass through Forest. The ESS of AIIB lists power transmission projects as projects which may have adverse environmental and social impacts (B) and hence requires ESIA.

Sr. No	Stages of Project	AIIB ESF 2022	National Regulations	Gaps identified
			Category B2 – Does not require EIA, goes directly to Appraisal stage.	
3	Assessment of Alternatives	Assessment of alternatives under ESS 1: Environmental and Social Assessment and Management. Examination to avoid or minimize environmental impacts.	As per EIA notification alternatives to the project's location, design, and technology document rationale or selecting the particular project location, design, and technology needs to take under consideration for Category A and Category B1 if the scoping exercise results in need of alternatives.	As per National Laws analysis of alternatives is not mandatory for sub-station and transmission line projects. However, as per AIIB guidelines, it is mandatory to analyse alternatives.
4	Prepare Environmental and Social Management Plan (ESMP)	Development and implementation of an ESMP. The ESMP shall include the monitoring plan with budgetary provisions.	The EIA manual for Category 'A' and Category 'B' projects calls for preparation of the EMP for the anticipated impacts. As this project falls under category B1 thus does not require EMP development. The EMP shall include the monitoring plan with budgetary provisions.	As per the GoI and GoA guidelines ESMP development and budget allocation is not required. The same is required as per AIIB's guidelines.
5	Public Consultation and Use of Project-Level Grievance Redress Mechanisms	Client conducts meaningful consultation with Project affected people to facilitate their informed participation in the consultations. Client continues consultation with stakeholders throughout the Project implementation as appropriate. Client to establish a Project-level GRM for PAPs and Workers respectively.	As per EIA notification 2006, all Category A and Category B1 projects or activities are required to undertake Public Consultation with certain narrowly specified exceptions. While, category B2 projects or activities don't require any such consultation. Grievance redress mechanism is not a part of the national regulations.	As per national regulations, sub-station and transmission line project do not need public consultation. EIA notification does not cover the grievance redress mechanism but AIIB guidelines requires a mechanism to receive and facilitate resolution of grievances or complaints
6	Information Disclosure	Public disclosure of E&S documents, including ESMP, on Client and AIIB websites as per policy provisions. Local translations of executive summaries of E&S documents should be disclosed as well. Regular disclosure of updated environmental and social information in the Project.	As per the EIA notification, 2006 Information disclosure required to be undertaken through public notice prior to the approval by the MoEF&CC only for Category A and B1 projects and no such disclosure required for category B2 in which substation and transmission line projects fall. Under the Environmental Notification, the regulatory authority and the State or Union Territory Pollution Control Board (SPCB or UTPCC) required to make the Draft report available for Category A and B1 projects	As per Indian standards information disclosure is not mandatory for Power Transmission projects whereas the AIIB guidelines requires information disclosure.

Sr. No	Stages of Project	AIIB ESF 2022	National Regulations	Gaps identified
			for inspection and a notified place during normal business hours prior to and up to the date of public hearing and prior to hearing.	
7	Use of Environmental Standards	As a general rule, AIIB bases the project assessment on the regulations that apply in the country in which the project is to be implemented. These regulations must be consistent with international environmental, social, health, safety and labour standards. These include the standards set by the Performance Standards of the International Finance Corporation (IFC) and the Environmental, Health and Safety (EHS) Guidelines of the World Bank Group. Other standards include; IFC Environmental and Social Impact Assessment Guidelines. For pollution prevention, international standards will apply. Environmental, health, and safety general guidelines, 2007. Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution.	The Environment (Protection) Rules, 1986 Various legislations addressing aspects such as air and water pollution, hazardous substance management, etc. Occupational health and safety standards included in the Factories Act (India) and various India specific Labor Laws.	There are no specific national guidelines on applicability of minimum environmental standards on power sub-station and transmission line. However, IFC's Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution clearly sets minimum environmental limits on air, water, noise and soil quality, which should be followed.
8	Monitoring and Reporting	As per AIIB guidelines, the executing agency and/or the recipient of the funds have/has to agree to certain reporting and notification duties and implement appropriate monitoring tools. If an ESMP including a monitoring plan has been developed, it will be used as a basis for monitoring, together with other elements to be monitored.	For Category A and B1 projects post environmental clearance (EC) monitoring is stipulated by the regulations, with half yearly compliance reports to be made available as public documents. Also, latest report displayed on website of regulatory authority. Which is not required for category B2 projects.	As per Indian Standards the power transmission projects do not require any monitoring and reporting whereas as per AIIB guidelines the project requires monitoring and reporting.
9	Compensation Resettlement and Rehabilitation	As per AIIB's requirement, regardless of the property title status, solutions on both situations of physical and/or economic displacement should be developed in consultation with the affected people. This may include inter alia measures such	Valuation of the land shall be done following the procedure laid down in LARRA, 2013. Value of the land and compensation amount shall be approved by the negotiation committee. The compensation of the damage is governed by the	National Regulations do not cover all displaced persons, such as non-titled on government land. While AIIB's and World Bank mandates compensation for all affected people regardless of

Sr. No	Stages of Project	AIIB ESF 2022	National Regulations	Gaps identified
		as e.g. provision of alternative housing, moving assistance, relocation allowances, compensation or other forms of support in order to improve or at least re-establish the livelihood of the affected people.	Electricity Act, 2003 and the Indian Telegraph Act, 1885. The compensation towards the damage is provided without the acquisition of land which are assessed/reviewed by the Revenue Authorities.	property title status.

3.5 AEGCL's Environmental and Social Policy and Procedures

AEGCL has collaborated with Multilateral Development Banks (MDBs) such as the World Bank (WB) and the Asian Development Bank (ADB). Through past projects, AEGCL established its Environmental and Social Policy and Procedures (ESPP)[10]. With experience gained from ADB-funded initiatives, AEGCL has adeptly developed and managed Environmental and Social (E&S) instruments in accordance with MDBs' stipulations. Additionally, AEGCL's operational safety manual[11] serves as a testament to its dedication to fulfilling E&S responsibilities, including occupational health and safety.

[10] https://www.powergrid.in/sites/default/files/inline-files/ESPPF_ASSAM.pdf

[11] https://www.aegcl.co.in/wp-content/uploads/2020/12/Safety_Manual_AEGCL.pdf

Chapter 4: Description of Environmental & Social Baseline Conditions

The proposed substations and associated transmission lines under Phase II of AIIB funded AISTSE project are spread across different geographical parts of Assam and thus this chapter establishes a broader level baseline environmental and social conditions towards the development of the Environmental and Social Management Framework (ESMPF). Additionally, this section incorporates an examination of the baseline environmental and social conditions specific to the proposed substation sites that were visited and analysed. The inclusion of baseline information is pivotal for informed decision-making in the project, facilitating environmental management planning, and devising strategies to mitigate potential impacts arising from project activities on the surrounding environment. The provided baseline information covers:

1. Physical environment
2. Ecological and Biological environment
3. Socio-economic and cultural environment

Assam situated in the North-East of India covers an area of 78,438 km^2 and is administratively divided into 35 districts with 78 sub-division, 219 Development Blocks and 2202 Gaon Panchayats, out of which3 districts with 4 sub-divisions & 16 Development Blocks are under three hill districts of Karbi-Anglong, East Karbi-Anglong and Dima Hasao. Further, four districts with eight sub-divisions are under Bodoland Territorial Council (BTC) area viz Kokrajhar, Chirang, Baksa and Udalguri.

4.1 Physical Environment

4.1.1 Physiography and Terrain

Assam, a state in north eastern India, exhibits a diverse physiographic landscape that can be broadly categorized into three main domains: the Brahmaputra Valley, Central Assam Hills (including Mikir Hills in Karbi Anglong and North Cachar Hill districts), and Barak Valley. The majority of Assam's terrain comprises floodplains situated along the Brahmaputra and Barak Rivers, with elevations ranging from as low as 25 meters to as high as 600 meters. The eastern plains reach an altitude of approximately 600 meters, while the Cachar plains in the southern part of the state are characterized by an altitude of about 25 meters. The central and south-central regions of Assam, encompassing North Cachar Hills and Rengma Hills, feature elevations ranging from 300 meters to 150 meters. Similarly, the western part of the state, including North and South Brahmaputra Hills, shares a similar altitude range. Satellite imagery reveals that the surface morphology is dominated by major river systems, characterized by numerous tributary rivers, streams, oxbow lakes, relict oxbow lakes, and stream channels.

4.1.2 Geology and Soil type

Assam boasts a diverse geological landscape, strategically situated near the intricate curves of the Himalayas. The intense geostatic pressures experienced during the Himalayan formation have resulted in extensive sedimentary deposits throughout Assam. This geological phenomenon accounts for the substantial oil reservoirs found in locations such as Digboi and Bongaigaon. The Cachar district in Assam stands as a significant repository of limestone, primarily composed of Calcium Carbonate a sedimentary rock. Among the varieties of coal—Peat, Lignite, Bituminous, and Anthracite Assam predominantly harbors the readily available Bituminous coal. Karbi Anglong is endowed with abundant deposits of Kaolin, commonly known as China Clay. Meanwhile, Morigaon

district hosts extensive reserves of granite, and the renowned Dhubri district boasts an approximate reserve exceeding ten million tons of Iron Ore. Nagaon district stands out for its substantial reserves of Glass Sand. Consequently, Assam's geological composition presents a rich treasure trove of minerals, a testament to its diverse geographical structure.

The predominant soil in the state is primarily of alluvial origin. In the northern regions, closer to the Brahmaputra River, the soil is characterized by new alluvium, whereas in the southern areas and those near the foothills, old alluvium prevails. The regions with older alluvial deposits prove to be ideal for tea cultivation, leading to the presence of numerous tea gardens in these areas. The entire region experiences a humid sub-tropical climate with well-distributed rainfall occurring from May to October. The undulating piedmont and hilly areas witness a significant process of soil leaching, while areas with gentle slopes are prone to stagnation and flooding. The National Bureau of Soil Survey and Land Use Planning (NBSS&LUP) has proposed a taxonomical classification of Assam's soils based on various factors such as soil depth, drainage, texture, occurrence, slope condition, exposed surface nature, and susceptibility to erosion and flooding.

Table 7: Distribution of Soils Types of Assam

Soil Order	Area (in ha)	Percentage of Soils	Local name
Inceptisols	3245.3	41.4%	Brahmaputra alluvial soils, Old alluvial soils
Entisols	2640.1	33.6%	Recent alluvial soils, Sandy soils
Alfisols	886.9	11.3%	Red soils
Ultisols	436.5	5.6%	Red soils
Miscellaneous	635.3	8.1%	-
Total	7844	100%	-

Source: Agriculture Department Assam, 2019

4.1.3 Climate, Rainfall and Temperature

Assam, characterized by a Tropical Monsoon Rainforest Climate, exhibits a temperate profile with substantial rainfall and humidity. The region's climate is humid, displaying a sub-tropical nature with warm, humid summers and cool, dry winters. Due to its unique geographical positioning and diverse physiography, Assam experiences a range of climatic conditions. Positioned in the high rainfall zone, the state receives an annual average rainfall of 2297.4 mm. The distribution of rainfall is as follows: 2% in Winter Season (January-February), 25% in Summer Season (March-May), 65% in Monsoon Season (June-September), and 7% in Post-Monsoon Season (October-December). Despite its favourable climate for food grain cultivation, Assam is susceptible to floods, and at times, faces drought-like situations due to insufficient rainfall. The state has witnessed erratic and unpredictable weather conditions, impacting agricultural productivity, particularly in recent years. In 2016, Assam experienced a rainfall of 2042.20 mm, a 7% deficit from the normal rainfall of 2295.80 mm. In the plains, the maximum temperature reaches around 38°C during the rainy season, while in the cool season, the minimum temperature drops to 8°C. Summers see maximum temperatures ranging from 35–38°C, while winters witness minimum temperatures between 6°–8°C. The spring season (March–April) and autumn season (September–October) are generally pleasant, characterized by moderate rainfall and temperatures.

4.1.4 Land use pattern

Agriculture is the dominant land use category in the state. It accounts for about 54.11% of the state's total geographical area. The total area under different types of the forest is approximately 23.62 % of the state's total area.

Table 8: Land Use Pattern of Assam

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	7,844	
Reporting area for land utilization	7,844	100
Forests	1,853	23.62
Not available for land cultivation	2,460	31.37
Permanent pastures and other grazing lands	167	2.13
Land under misc. tree crops and groves	220	2.80
Cultivable wasteland	142	1.81
Fallow land other than current fallows	87	1.11
Current fallows	87	1.11
Net area sown	2827	36.05

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2014-15)

4.1.5 Agro-Climatic Zones

Assam is categorized into six distinct agro-climatic zones based on factors such as rainfall patterns, terrain, and soil characteristics. These zones and their respective percentages of the total state area are as follows:

- North Bank Plain Zone (encompassing Darrang, Sonitpur, Lakhimpur, and Dhemaji districts), occupying 18.37% of the total state area.
- Upper Brahmaputra Valley Zone (covering Golaghat, Jorhat, Sivasagar, Dibrugarh, and Tinsukia districts), representing 20.4% of the total state area.
- Central Brahmaputra Valley Zone (encompassing Nagaon and Marigaon districts), constituting 7.08% of the total state area.
- Lower Brahmaputra Valley Zone (including Goalpara, Dhubri, Kokrajhar, Bongaigaon, Kamrup, Nalbari, and Barpeta districts), occupying 25.75% of the total state area.
- Barak Valley Zone (encompassing Cachar, Karimganj, and Hailakandi districts), covering 8.9% of the total state area.
- Hill Zone (incorporating North Cachar Hills and Karbi Anglong districts), representing 19.4% of the total state area.

4.1.6 Natural Hazards

The distinctive geo-climatic conditions prevalent in Assam and the broader north eastern region of India render them highly susceptible to a variety of natural disasters, including floods, earthquakes, landslides and Cyclones. Assam, in particular, grapples with recurring challenges such as perennial floods, river bank erosion, landslides, and other environmental catastrophes. These disasters lead to abrupt disruptions in the normal functioning of society, causing significant damage to property and resulting in a high toll on human life.

Earthquake

Nestled between the collision plate boundaries of the Himalayas to the north and the Indo-Burman region to the east, the entirety of North-eastern India, particularly Assam, experiences high seismic activity. Despite being seismically stable, the Assam valley stands out as exceptionally vulnerable due to its substantial sedimentary cover. The thick sedimentary layer makes the region highly susceptible to damage in the event of an earthquake originating in nearby seismic zones such as the Himalayan tectonic zone, Indo-Burman belt, or the Shillong Plateau. Assam is officially classified as earthquake Zone-5, signifying a high level of seismic risk in the area. Besides the two great earthquakes in 1897

and 1950 measured 8.7 on Richter scale there are as many as twenty earthquakes of magnitudes 6.0 to 7.0 occurred in this region during past 100 years.

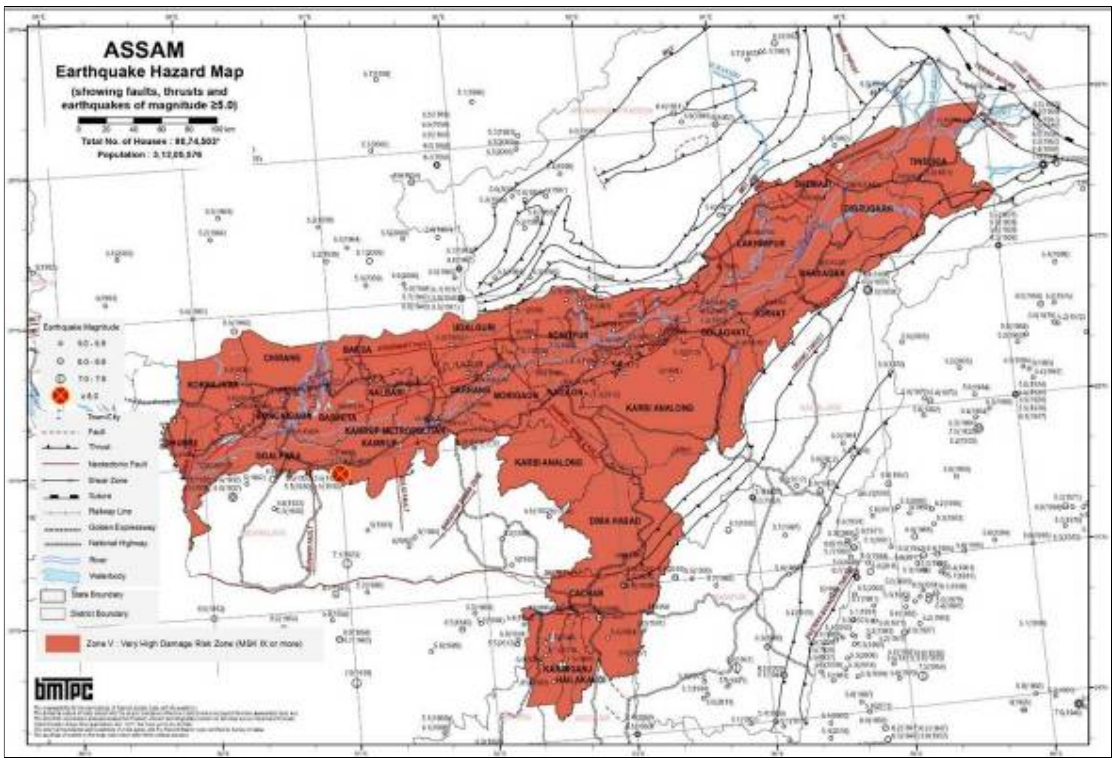


Figure 3 : Earthquake Hazard map of Assam

Source: Vulnerability Atlas of India, 3rd Edition, 2019

Flood

The plains of Assam, traversed by the Brahmaputra and Barak River systems, have witnessed recurrent inundations, with varying frequency and damage over time. In specific areas of the Brahmaputra and Barak valleys, floods of differing magnitudes now occur three to four times annually. The causes of these persistent floods in Assam are multifaceted, stemming from both natural and anthropogenic factors. Natural elements contributing to the recurrent floods include a high-intensity monsoon rainfall pattern, deforestation in the upper catchments leading to easily erodible geological formations, and consequent accelerated basin erosion and rapid channel aggradations. Additionally, intense land use pressure, explosive population growth particularly in flood-prone regions and the implementation of ad hoc temporary flood control measures further compound the issue. A pivotal factor in the frequent flooding of the region is the highly dynamic monsoon regime interacting with the unique physiographic characteristics of the basin. While Assam has a history of coping with floods, the situation escalated into a perennial challenge following the devastating earthquake of August 15th, 1950. The people of the state have had to adapt to these recurring floods, navigating their lives amidst the ever-changing landscape shaped by both natural and human-induced factors.

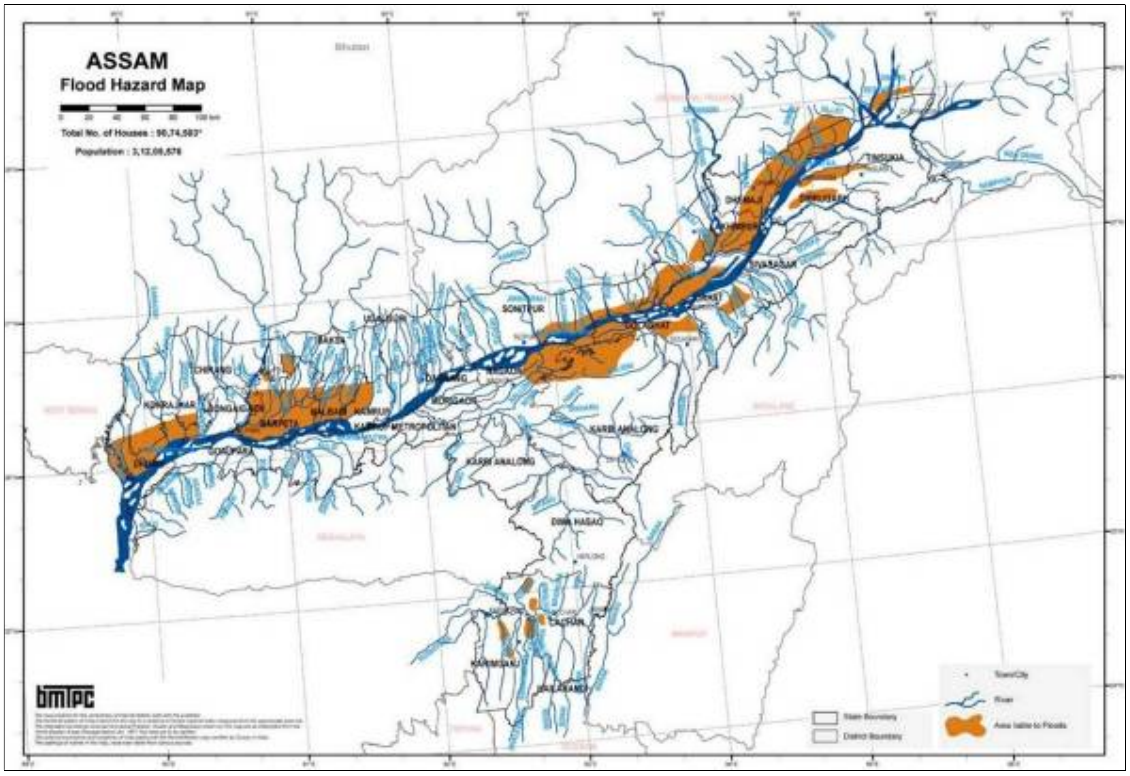


Figure 4 : Flood Hazard Map of Assam

Source: Vulnerability Atlas of India, 3rd Edition, 2019

Landslides

Landslides are sudden, short-lived geomorphic events that involve a rapid-to-slow descent of soil or rock in sloping terrains. It can also be caused by excessive precipitation or human activities, such as deforestation or development that disturb natural slope stability. Landslides are caused when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. In the recent past, Guwahati and other towns of Assam have witnessed a number of devastating landslides in its hilly belt. Fragile eco-system of the hilly areas due to poor communication, bad road, indiscriminate, gross misuse of land and forest, economic conditions of the inhabitants create serious administrative problems. The resultant loss of life and property has become a matter of concern. The hill slope failure and soil erosion associated with siltation flash floods and water logging in the low-lying areas also creates immense problems in the city drainage and sewerage system. Heavy and continuous rainfall during monsoon aggravates the process of slope failure.

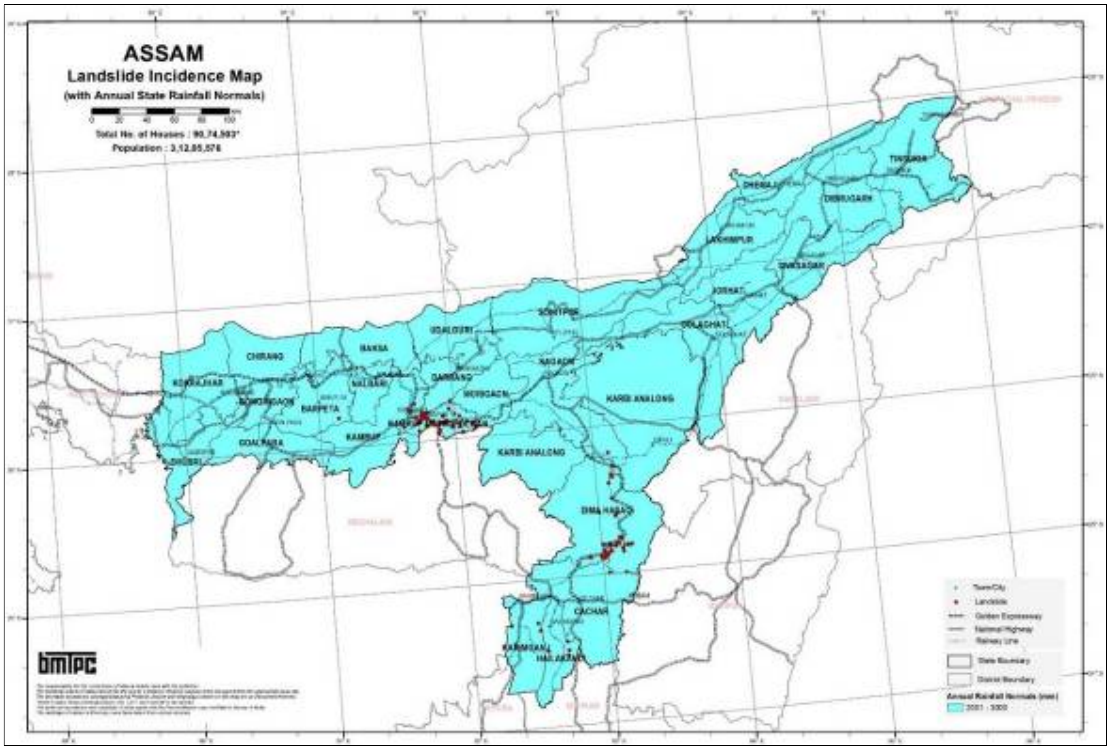


Figure 5 : Landslide Incidence Map of Assam

Source: Vulnerability Atlas of India, 3rd Edition, 2019

Wind and Cyclone

Assam is highly prone to cyclone/winds. Every year about 60-70% of the area is affected by cyclones occurring in Bangladesh. Due to their specific locations, districts like Dhubri, Gaolpara, Hailakandi, Chachar and KarbiAnglong are more prone to cyclone/winds. Districts namely Kokrajhar, Bongaigaon, Kamrup, Barpeta, Nalbari, Darrang, Sonitpur, Nagaon, Marigaon, Lakhimpur, Dhemaji, Sibsagar, Jorhat, Golaghat, Dibrugarh, Tinsukia and Karbi Anglong are likely to experience wind speed of 50 m/s whereas districts like Hailakandi, Karimganj and Cachar have wind speed of more than 55m/s and are more vulnerable to cyclonic storms. Occasional cyclones do occur in western Assam and their severity is more during monsoon. According to BMTPC cyclone zonation, north-west districts of Assam are lying in zone of high damage where wind speed can reach up-to 47 m/s an hour. Districts close to Bangladesh are in very high damage zone due to proximity of Bay of Bengal (which is a cyclone basin). In this zone wind speed can reach up-to 55 m/s an hour and can result into large scale damage. **Figure 6** indicates the wind speed zonation of Assam along with the tracks of the recent events of cyclones recorded within the state.

Recently, on 15-16 April 2022, during Rongali Bihu (Assamese New Year) a severe cyclonic storm hit the state causing 12 reported deaths in Dibrugarh, Goalpara, Barpeta, Baska and Tinsukia districts. As per the report of ASDMA, a total of 21,000 people was affected and 7,344 houses were damaged (partially and fully) in the affected districts. (Source ASDMA).

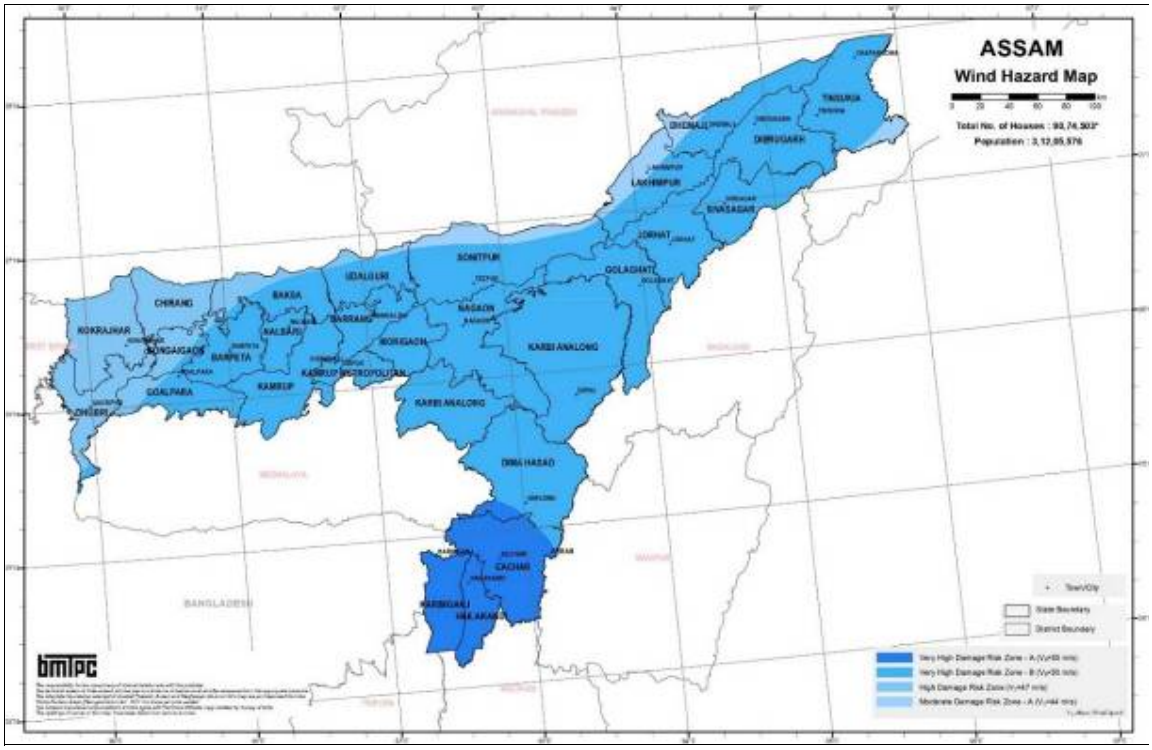


Figure 6 : Wind hazard Map of Assam

Source: Vulnerability Atlas of India, 3rd Edition, 2019

4.1.7 Water Resources

Assam is blessed with abundant water resources, characterized by extensive perennial rivers and other water bodies, alongside a rich aquifer indicating the vastness of its water wealth. Surface water manifests in the form of rivers, streams, lakes, swamps, and ponds, while groundwater is accessible at low to moderate depths throughout the entire state. Although there are seasonal and regional variations in water availability, the overall annual water resource remains relatively constant. In recent decades, the utilization of water has surged at a rapid pace, exceeding the growth rate of the human population by more than twice. This heightened demand for water is attributed to both the increasing human population and the diversification of human activities. The escalating per capita consumption of water across domestic, agricultural, and industrial sectors is contributing to a decline in the potential per capita availability of water. Furthermore, this trend raises concerns about significant deterioration in water quality.

A. Surface Water

Assam is endowed with number of perennial rivers and wetlands (including lakes) locally known as *beel*. The state is drained by the networks of the Brahmaputra and the Barak rivers with a large number of associated tributaries (73 and 11, respectively). The vast potential surface water resource of the state is not yet properly utilized in the state. In the last few decades, the rate of consumption of water in the agricultural sector, industrial sector and in the urban centres has been increased significantly. The discharge so fun treated domestic wastewater, industrial waste water, run of from the agricultural fields and the urban sewage water posing threat to the water bodies of the state. The description of the Brahmaputra and Barak River Systems is provided in table below:

Table 9: River System in Assam

River System	A Glimpse
Brahmaputra River System	The Brahmaputra is one of the biggest rivers of the world. The Brahmaputra basin covers an area of 5,80,000 sq. km of which 1,94,413 sq. km falls in India. Brahmaputra is a perennial river, fed by snow as well as by rain. The Brahmaputra rolls down the plain of Assam from east to west for a distance of 640 km up to Bangladesh border. It is the fourth largest river in the world in term of average water discharge at the mouth with a flow of 19,830 m^3/s. The river carries 82 per cent of its annual flow during the rainy season (May through October). Through its course, the river receives innumerable tributaries (about 73) coming out of the northern, north-eastern and the southern hill ranges. The mighty river with a well-knit network of tributaries drains an area of 56,480 sq. km of the state accounting for 72 per cent of its total geographical area. Most of the right bank tributaries of Brahmaputra are snow as well as rain feed and are perennial. Although the left bank tributaries are mainly rain-feed but perennial in nature.
The Barak River System	Barak is the second largest river system in the North East India as well as in Assam. The river with a total length of 900 km from source to mouth drains an area of 52,000 sq. km. In India and traverses a distance of 532 km up to the Indo-Bangla border. Like Brahmaputra, the Barak is also a perennial river of the state. The important north bank tributaries of Barak River are Jiri, Siri, Madhura, Jatinga and Larang, while the important south bank tributaries include Sonai, Ghagra, Katakhal, Dhaleswari, Singla and Longai. The flows of the rivers in Assam decrease considerably during the dry season. They maintained pick flow in summer rainy months.

Source: ENVIS, Assam

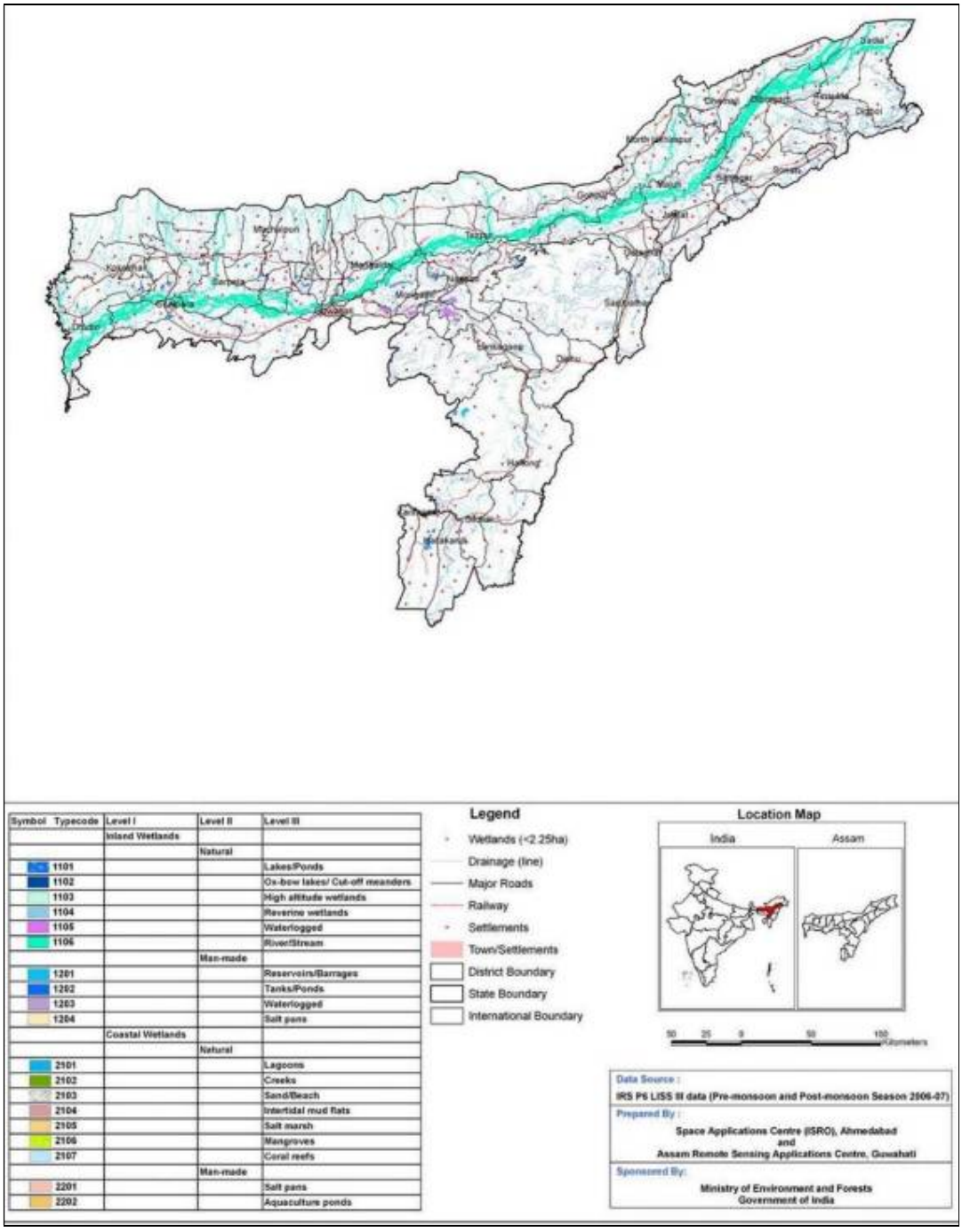
B. Wetlands

The National Wetland Atlas reveals the presence of 5,097 wetlands in the state of Assam, with an additional identification of 6,081 small wetlands covering an area of less than 2.25 hectares. These wetlands collectively occupy an estimated 764,372 hectares, constituting approximately 9.74% of the state's total geographic area. Natural wetlands predominate, with river/stream ecosystems representing the majority at 84% (63,7164 hectares), followed by lake/pond (51,257 hectares), waterlogged areas (47,141 hectares), and ox-bow lakes (14,173 hectares). Notably, two reservoirs/barrages with a total area of 2,833 hectares have been mapped as significant man-made wetland features. Aquatic vegetation is prominently observed in lake/ponds, waterlogged areas, and riverine wetlands. The geographical coverage of various types of wetlands and wetland map of the state are given in the **Table 10** and **Figure 7** below.

Table 10: Area of wetlands in Assam

Assam State	Total Geographic Area (Ha.)	Area of Wetlands (inHa)									
		Lake/Pond	Ox-bow Lake Cut-off Meander	Riverine Wetland	Natural Waterlogged	River/ Stream	Reservoir Barrage	Tank/Pond	Waterlogged (Manmade)	Wetland of <2.25ha	Total
Area Coverage	7843800	51,257	14,173	4,258	47,141	637,164	2,833	921	544	6,081	764,372
Numbers	-	1,175	873	139	2,461	213	2	180	54	6,081	11,178
% of Total Wetland Area	-	6.71	1.85	0.56	6.17	83.36	0.37	0.12	0.07	0.80	-

Source: National Wetland Atlas



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Figure 7 : Wetlands and River Systems of Assam

Source: National Wetland Atlas, Assam, 2010

Deepor Beel: The Ramsar Site of Assam

India has 27 Ramsar Sites and Deepor Beel is the only one in Assam. The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific & recreational value.

Deepor Beel, a freshwater lake, is situated in the Kamrup district of Assam to the southwest of Guwahati city. Recognized as a designated wetland under the Ramsar Convention in November 2002,

this expansive natural wetland holds significant biological and environmental value, serving as a crucial stormwater storage basin for Guwahati. With a vast expanse of approximately 6.89 square kilometers (notably less than earlier estimates of 40 square kilometers), Deepor Beel boasts a rich diversity of flora and fauna. The ecosystem of Deepor Beel supports a multitude of residential water birds, and it annually welcomes numerous migratory birds. Additionally, the beel attracts Wild Asian elephants from the Rani and Garbhanga forests, with their regular movements meticulously documented by forest officials. The Guwahati Water Bodies (Preservation and Conservation) Act, 2008, designates Deepor Beel and safeguards an area of about 6.89 square kilometers. While historical reports suggested a larger expanse of 40 square kilometers, the current confirmed wetland area is estimated to be between 13 to 15 square kilometers. Deepor Beel remains a vital natural habitat, playing a crucial role in supporting biodiversity and acting as a key ecological asset for the city of Guwahati.

Figure 8 : Deepor Beel: The Ramsar Site of Assam

Source: https://rsis.ramsar.org/ris/1207

B. Ground Water

Assam boasts significant groundwater development potential, particularly in the Brahmaputra valley, which encompasses over 70% of the state's total geographical area. This region houses a prolific aquifer system, with the water table lying within 5 meters of the land surface. The Barak valley also demonstrates promising potential for groundwater development. Despite being the most populous part of the state, the current level of groundwater development in the Brahmaputra valley is still in its early stages.

According to CGWB, hydro-geologically the state can be divided into three units namely consolidated formation, semi consolidated formation and unconsolidated formation. More than 75% of the state is underlain by unconsolidated formation comprising of clay, silt, sand, gravel, pebble and boulders. The Bhabar belt is about 11 to 15 km wide; the tubewells yield 27 to 59 m^3/hr in this zone. The Terai zone follows immediately down slope of the Bhabar zone where the yield of the wells ranges between 80-240 m^3/hr. The flood plains follow the Terai in Brahmaputra valley where the shallow tubewells yield between 20-50 m^3/hr. and deep tubewells between 150-240 m^3/hr. In the semi consolidated formations of Cachar district, the yield of the tube well ranges between 50 to 100 m^3/hr.

As identified by CGWB, all the blocks spread over 26 districts across the state of Assam of Assam are of Safe category. None of the blocks have been reported as ‘Semi-Critical, ‘Critical, ‘Over-exploited’ category under district wise categorization of Groundwater Blocks of the state.

Table 11 presents quality issues pertaining to ground water as identified by CGWB across various district of the state of Assam.

Table 11: Ground Water Quality problem recorded by CGWB

Contaminants	Districts affected (in part)
Fluoride (>1.5 mg/l)	Goalpara, Kamrup, KarbiAnglong, Naugaon, Golaghat, Karimganj
Iron (>1.0 mg/l)	Cachar, Darrang, Dhemaji, Dhubri, Goalpara, Golaghat, Hailakandi, Jorhat, Kamrup, Karbi Anglong, Karimganj, Kokrajhar, Lakhimpur, Morigaon, Nagaon, Nalbari, Sibsagar, Sonitpur, Bongaigaon, Dibrugarh.
Arsenic (above 0.05 mg/l)	Sivsagar, Jorhat, Golaghat, Sonitpur, Lakhimpur, Dhemaji, Hailakandi, Karimganj, Cachar, Barpeta, Bongaigaon, Goalpara, Dhubri, Nalbari, Nagaon, Morigaon, Darrang and Baksa

Source: CGWB

For any project footprints falling within few hundred meters of waterbody, the water quality data needs to be collected as baseline to compare impacts during construction, using GoI guidelines. The ground water and surface water quality standards are provided in **Appendix 3.**

4.1.8 Ambient Air and Noise Quality

A. Ambient Air Environment

The Pollution Control Board of Assam (PCBA) is carrying out ambient air monitoring under NAMP since 1991. The programme in Assam was started with one station at SPCB, Assam, Guwahati in 1991. The no. of monitoring stations has been increased to 22 in Assam, all these stations are in residential areas only.

Table 12: List of Air Quality Monitoring Station & Location in Assam

District	No. of Monitoring Station	District	No. of Monitoring Station
Kamrup Metro	6	Baksa	1
Bongaigaon	2	Cachar	2
Sonitpur	1	Tinsukia	2
Sivasagar	2	Lakhimpur	1
Dibrugarh	1	Nagaon	1
Golaghat	1	Nalbari	1

Source: Assam Pollution Control Board

The ambient air quality monitoring data and Noise level monitoring data was collected from Assam Pollution Control Board, the provided data includes the concentration of Sulphur Oxide, Nitrogen Dioxide and Particulate Matter at eleven locations in five districts.

Table 13: Air Quality Monitoring Data

Station Code	Sampling Date	Name of Monitoring Station	City	SO_2	NO_2	PM10 ($\mu g/m^3$)	Remarks
607	22/02/2019	Janiganj, Silchar	Silchar	8	13	59	Clear
567	23/02/2019	Office building of RLO, near Ithkola Market, Ghaniwala road	Silchar	6	12	49	Cloudy
606	05/02/2019	Shivdham, Tinsukia	Tinsukia	9	18	87	Clear
538	28/02/2019	Dibrugarh Office Building, Dibrugarh	Dibrugarh	5	10	34	Rainy
595	28/02/2019	Water Resources Division Office Campus, Christian Patty, near	Nagaon	8	16	138	Clear

Station Code	Sampling Date	Name of Monitoring Station	City	SO_2	NO_2	PM10 ($\mu g/m^3$)	Remarks
		Nagaon College					
603	27/02/2019	Boragaon, Dist.- Kamrup, Guwahati	Guwahati	5	16	94	Clear/Partly rainy
602	25/02/2019	Guwahati University Campus, Dist-Kamrup, Guwahati	Guwahati	6	19	106	Clear
193	29/03/2019	Head Office, Bamunimaidan, Guwahati	Guwahati	20	40	227	Clear
519	29/03/2019	ITI Building, Gopinath Nagar, Guwahati	Guwahati	9	26	273	Clear
541	29/03/2019	Near Pragjyotish College, Santipur, Guwahati	Guwahati	10	19	211	Clear
596	13/03/2019	Khanapara, Central Dairy	Guwahati	6	16	151	Clear

Source: Assam Pollution Control Board

Various anthropogenic activities along with the industrial activities has an irreversible impact on the air quality. It is dynamics in character and a change in air quality in certain place have impacts on places far away falling in the direction of prevailing air passage. Air pollution adversely affects the biological species in affected areas including human beings causing many diseases. The problem of pollution and its adverse ecological impacts get adverse due to increasing industrial and anthropogenic activities. Monitoring of air quality on specific points relating to the sources of air pollution is an essential exercise of the Board. In order to have better understanding on air environment, baseline information on the status w.r.t. to air environment is important.

Table 14: National Ambient Air Quality Standards (CPCB notification, 2009)

Sl No.	Pollutants	Time weighted average	Concentration in Ambient Air	
			Industrial, Residential, Rural & other Areas	Ecologically Sensitive Areas (Notified by Central Government)
1	Sulphur Dioxide (SO_2) $\mu g/m^3$	Annual*	50	20
		24 Hours**	80	80
2	Nitrogen Dioxide (NO_2) $\mu g/m^3$	Annual*	40	30
		24 Hours**	80	80
3	Particulate Matter (size less than 10 µm) or PM_{10} $\mu g/m^3$	Annual*	60	60
		24 Hours**	100	100
4	Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ $\mu g/m^3$	Annual*	40	40
		24 Hours**	60	60

** Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.*

*** 24 hourly or 8 hourly or 1 hourly monitored value, as applicable, shall be complied with 98% of the time in a year.*

2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Table 15: National Ambient Air Quality Standards (CPCB notification, 2009)

Air Quality Parameters 24-hour max content	SO_2 (ug/m^3)	NO_2 (ug/m^3)	PM_{10} (ug/m^3)	$PM_{2.5}$ (ug/m)	CO (ug/m 3)
GoI regulations -24 hour	80	80	100	60	2
WHO Ambient Air Quality (WB EHS 2007) Guidelines-24 hour	20	40 (Annual)	50	25	-

Note: The more stringent of the two - the GoI regulations and IFC EHS guidelines will be followed for monitoring purposes. Data suggest that several locations would be Degraded Airshed for PM. Careful attention will be paid to dust management in vicinity of receptors for construction phase.

B. Acoustic (Noise) Environment

In accordance with Rule 3 of the Noise Pollution (Regulation and Control) Rules, 2000, the State Government is mandated to classify areas as industrial, commercial, residential, or silence zones, thereby facilitating the enforcement of noise standards tailored to each category. The State Government is further tasked with implementing measures to mitigate noise, including that emanating from vehicular activities, and ensuring that prevailing noise levels adhere to the specified ambient air quality standards outlined in these rules. Development authorities, local bodies, and other relevant agencies, in the course of planning and executing activities related to town and country planning, are required to consider noise pollution comprehensively as a parameter influencing the quality of life. This consideration aims to prevent the proliferation of noise disturbances and align with the overarching goal of maintaining ambient air quality standards concerning noise.

A zone of at least 100 meters surrounding hospitals, educational institutions, and courts may be officially designated as a silence area or zone under the provisions of these rules. The noise levels within any designated area or zone must not surpass the ambient air quality standards for noise outlined in the Schedule. The authority is tasked with ensuring the implementation of measures to control noise pollution and overseeing the proper adherence to ambient noise level standards.

Table 16: Noise Level Monitoring Data

Date	Location	L_{min}	L_{max}	Leq dB(A)	Area Type
28th March 2019	At GMCH Campus, Bhangagarh	55.7	73.8	61.1	Commercial
	Assam Sachivalaya, Dispur (Near Main Gate)	67.1	78.7	70.5	Commercial
	Khanapara, Infront of Veterinary college	62.0	90.3	71.0	Silence
	Basistha Chariali, N.H-37	70.2	83.2	75.6	Industrial /commercial
	LokhraChariali, N.H-.37	74.4	82.0	77.9	Industrial / commercial
	PachimBoragaon Chowk, N.H-37	65.1	89.9	78.3	Industrial / commercial
	Guwahati University Campus, (Near Environmental Building)	49.9	69.1	56.8	Silence

Source: Assam Pollution Control Board

Table 17: Ambient Quality Standards in respect of Noise

Area Code	Category of Area/Zone	CPCB Limits in dB(A) L_{eq} *		WHO	
		Day Time	Night-time	Day Time	Night-time
(A)	Industrial area	75	70	70	70
(B)	Commercial area	65	55	70	70
(C)	Residential area	55	45	55	45
(D)	Silence Zone	50	40	55	45

***Source: Central Pollution Control Board, India and* www.ifc.org/ehsguidelines**

4.2 Ecological and Biological Environment

4.2.1 Biodiversity

Biodiversity, in its comprehensive sense, encompasses the entirety of biological diversity, ecological and evolutionary processes, including natural ecosystems, wild species and varieties, agricultural ecosystems, and domesticated species and varieties. Northeast India serves as the bio-geographic gateway to the Indo-Burmese hotspot, situated at the intersection of the Indian Subcontinent and

the Indo-China Bio-geographic regions, making it notable for its genetic diversity. As a pivotal component of Northeast India, the state of Assam possesses distinctive Indo-Malayan and Indo-Chinese characteristics that contribute significantly to its biodiversity. The state's altitudinal variations and unique climatic conditions give rise to diverse ecosystems, encompassing wet evergreen forests, moist deciduous forests, wet savannahs, riparian forests, swamps, marshes, wetlands, and river systems. These varied habitats collectively maintain a rich gene pool supporting a wide array of fauna.

4.2.2 Forest

Assam, situated in North Eastern India, stands out as a biodiversity hotspot, earning recognition as the "Biological Gateway" of the region and the birthplace of flowering plants due to its remarkable floristic abundance. Numerous scholars have been inspired to characterize Assam as a unique and vital hub for biological diversity.

Forest Status

The State has reported the extent of recorded forest area (RFA) as 26,832 sq km which is 34.21% of its geographical area. The reserved and unclassed forests are 66.58% and 33.42% of the recorded forest area in the State, respectively.

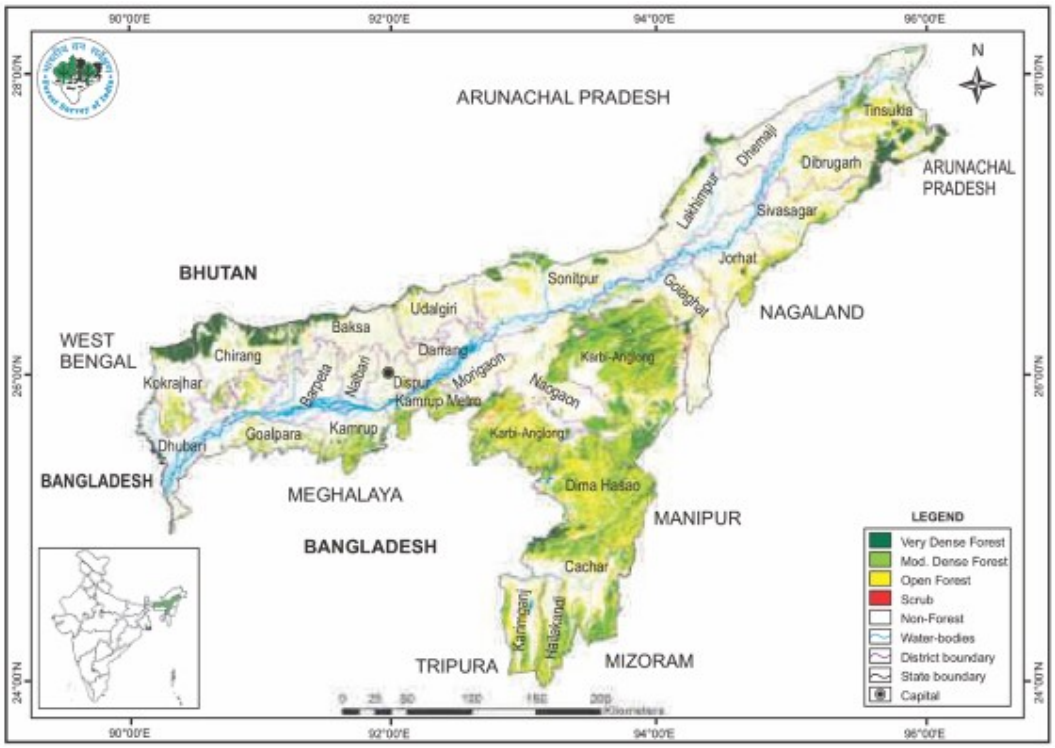


Figure 9 : Forest cover map of Assam

Source: India State of Forest Report, 2019

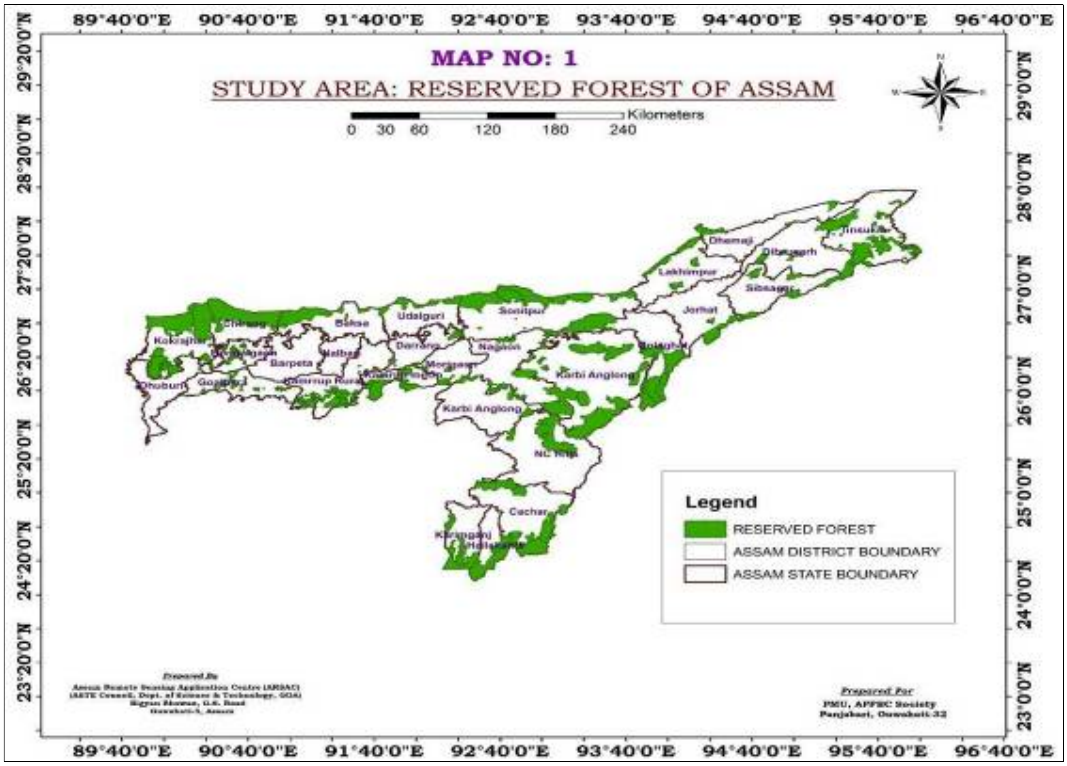


Figure 10 : Reserve Forest map of Assam

Source: India State of Forest Report, 2019

Table 18: District-wise Forest Cover in Assam (Area in Sq. Km)

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessmen	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Baksa	2.457	156.00	130.01	273.66	559.67	22.78	3.67	6.00
Barpeta	2.282	0.00	33.21	81.97	115.18	5.05	10.18	1.00
Bongaigaon	1.093	0.00	62.18	187.95	250.13	22.88	14.13	0.00
Cachar	3.786	93.00	1,077.58	1,051.76	2,222.34	58.70	-0.66	17.45
Chirang	1.923	402.00	110.45	187.39	699.84	36.39	5.84	3.00
Darrang	1.585	0.00	13.89	75.54	89.43	5.64	3.43	1.00
Dhemaji	3.237	68.00	124.66	152.14	344.80	10.65	6.80	4.00
Dhubri	2.176	1.00	22.44	75.02	98.46	4.52	8.46	4.00
Dibrugarh	3.381	105.8	68.10	581.27	755.23	22.34	-1.77	1.00
Dima Hasao	4.888	209.00	1,519.73	2,478.20	4,206.93	86.07	-3.07	4.00
Goalpara	1.824	14.00	137.66	244.08	395.74	21.70	97.74	1.72
Golaghat	3.502	21.00	119.30	529.61	669.91	19.12	18.91	4.00
Hailakandi	1.327	13.00	366.04	395.30	774.34	58.35	1.34	1.48
Jorhat	2.851	12.00	103.00	445.10	560.10	19.65	6.10	4.00
Kamrup	3.105	50.00	455.95	457.52	963.47	31.03	44.47	3.00
Kamrup Metropolitan	955	0.00	225.00	235.05	460.05	48.17	0.05	1.00
Karbi-Anglong	10.434	583.93	3,766.62	3,538.63	7,889.18	75.61	-93.82	84.38
Karimganj	1.809	3.00	300.23	548.20	851.43	47.07	35.43	0.76
Kokrajhar	3.296	438.00	270.19	458.38	1,166.57	35.39	8.57	1.00
Lakhimpur	2.277	29.00	85.88	191.69	306.57	13.46	11.57	0.96
Morigaon	1.551	10.00	42.00	122.11	174.11	11.23	0.11	4.00
Naogaon	3.973	50.00	363.00	498.26	911.26	22.94	1.26	9.00
Nalbari	1.052	0.00	30.84	76.27	107.11	10.18	13.11	0.00
Sibsagar	2.668	9.00	152.83	528.13	689.96	25.86	1.96	2.40

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessmen	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Sonitpur	5.204	108.97	257.53	703.11	1,069.61	20.55	14.61	3.38
Tinsukia	3.790	410.10	353.92	818.55	1,582.57	41.76	3.57	9.90
Udalguri	2.012	8.00	86.67	317.85	412.52	20.50	9.52	1.00
Grand Total	78.438	2,794.86	10,278.91	15,252.74	28,326.51	36.11	221.51	173.43

(Source: India State of Forest Report, 2019)

Forest Types in Assam

Percentage area under different forest types of Assam as per the Champion & Seth classification (1968), according to the latest exercise, is presented in **Table 19**.

Table 19: Percentage area under different forest types of Assam

S. No.	Forest Type	% of Forest cover
1.	1B/C1 Assam Valley Tropical Wet Evergreen Forest (Dipterocarpus)	3.56
2.	1B/C3 Cachar Tropical Evergreen Forest	3.11
3.	1B/C2a Kayea Forest	0.76
4.	1B/C2b Mesua Forest	0.02
5.	2B/C2 Cachar Semi-Evergreen Forest	37.75
6.	2/2S1 Secondary Moist Bamboo Brakes	3.01
7.	2B/C1a Assam Alluvial Plains Semi-Evergreen Forest	1.60
8.	2B/1S1 Sub-Himalayan Light Alluvial Semi-Evergreen Forest	1.25
9.	2B/2S2 Eastern Alluvial Secondary Semi-Evergreen Forest	1.23
10.	2B/2S1 (Pioneer Euphorbiaceous Scrub)	0.28
11.	2B/1S2 Syzygium Parkland	0.07
12.	3C/C3b East Himalayan Moist Mixed Deciduous Forest	17.92
13.	3C/C2d(iv) App. Kamrup Sal	2.71
14.	3C/C1b(I) East Himalayan Upper Bhabar Sal	2.37
15.	3C/2S1 Northern Secondary Moist Mixed Deciduous Forest	1.93
16.	3C/1S1 Low Alluvial Savannah Woodland (Salmalia albizzia)	0.05
17.	3C/C1a(ii) Khasi Hill Sal	0.12
18.	3/1S2a Terminalia-Lagerstroemia	0.01
19.	4D/SS1 Eastern Seasonal Swamp Forest	0.01
20.	4C/FS3 Creeper Swamp Forest	0.00
21.	4D/2S1 (Syzygium Parkland)	0.00
22.	4D/2S2 Eastern Wet Alluvial Grassland	0.53
23.	5/1S2 Khair-Sissu Forest	0.08
24.	8B/DS1 (Assam Subtropical Hill Savannah Woodland)	0.04
25.	9/C2 Assam Sub-Tropical Pine Forest	0.41
26.	Plantation/TOF	21.18
	Total	**100.00**

Source: India State of Forest Report, 2019

4.2.3 Protected Area Network

Protected areas are heterogeneous mixture of a variety of landscapes, plants, birds and animals. The suitable climatic conditions, geographical location and vast forest reserves have made Assam a favourable destination for birds, animals and natural vegetation. These are the breeding ground for some of the rarest global species. They provide shelter to large number of wildlife right from the Golden Langur to the horned rhinoceros. The Protected area Network in Assam occupies 5272.595

sq. km. area and constitutes about 5% of the State's geographical area; they play a very important role in the in-situ conservation of biodiversity. The Protected Areas Network (PAN) includes:

- 7 National Parks
- 22 Wildlife sanctuaries
- 3 Proposed Wildlife Sanctuaries
- 3 Tiger Reserves (Manas, Nameri, Kaziranga)
- 5 Elephant Reserves
- 2 Biosphere Reserves
- 2 World Natural Heritage Sites

4.2.4 Flora and Fauna

India is one of the 17 mega bio-diverse countries in the world and accounts for 7.8% of the recorded species. The state of Assam is a constituent unit of Eastern Himalayan Biodiversity Region; one of the two biodiversity hotspots in the country. Assam is part of one of the 25 mega diverse region on the planet. Assam is known for its ecological diversity, for the range of floral and faunal species. Categories of threatened plants recognized by IUCN have been reported from Assam. Besides the above; 284 species of plants are observed to be critically endangered; 149 species are endangered; 58 species are vulnerable and 13 species are near threatened. The flora and fauna diversity in Assam is given in **Table 20.**

Table 20: Floral and Faunal Diversity in Assam

Floral diversity	Faunal diversity
Angiosperms: 3017 species Gymnosperms: 23 specie Medicinal Plants: 952 species Orchids: 193+ species Bamboos: 42 species Cane: 14 species Ferns: 315 species Aquatic Plants: 100+ species	Mammals: 164+ species Primates: 10 species Birds: 800+ species (280 migratory) Reptiles: 116 species (approx.) Amphibians: 60+ species Fishes: 197 species Molluscs: 39 species Butterflies: 1500 species (approx.) Moths: 387 species

Favorable geographical location, diversified topography and ideal climatic conditions have made Assam very rich in biodiversity. The vegetation of Assam is primarily of tropical type covering areas of evergreen, semi-evergreen, grasslands, deciduous forests, grasslands and riverside forests. Some important tree species found in Assam are Hoooong (*Dipterocarpus macrocarpus*), Gurjan (*Dipterocarpus tubinatus*), Mekai (*Shoreaassamica*), Kurta (*Palaquiumpolyanthum*), Nahar (*Mesua ferrea*), Sia-nahar (*Keyeaassamica*), Sissoo (*Dalbergia sissoo*), Khair (*Acacia catechu*) etc.

4.2.5 Eco-Tourism

Assam stands prominently as a leading eco-tourism destination in India, boasting five national parks, numerous wildlife sanctuaries, and two bird sanctuaries dedicated to safeguarding and conserving the state's diverse wildlife. The tourism offerings in Assam are as varied as its landscapes, encompassing tea plantations, meandering rivers, rich wildlife, religious sites, adventure opportunities, and a vibrant cultural tapestry. The state is adorned with lofty mountains and lush valleys, while its dense forests, abundant flora and fauna, and expansive waterways create awe-inspiring vistas.

4.3 Socio-economic Environment[12]

4.3.1 Demographic Profile

Assam is a state of heterogeneous population with socio-cultural and ethnic diversity. According to the Census of India, 2011 the total population was 312.05 lakh out of which the male and female population of Assam were 159.39 lakh and 152.66 lakh respectively. The projected population (released by Census of India) of Assam in 2022 is found as 353.78 lakh of which 180.06 lakh are male and 173.84 lakh are female. The decadal growth rate of the state population during 2001-2011 was 17.07% against 17.68% growth for the country as a whole. Out of total population in the state, 86% population lived in rural areas and 14% population in urban areas. The percentage of rural population of the state was higher than all India average (69%). However, the urban population in the state had increased from 12.9% in 2001 to 14% in 2011.The density of population of Assam in 2011 was 398 person per sq.km. as compare to 340 persons in 2001. The sex ratio (number of females per thousand male) of Assam had increased to 958 in 2011 from 935 in 2001.Compare to overall sex ratio of the state, the child sex ratio (age group 0-6 years) had gradually declined from 975 in 1991 to 967 in 2001 and further to 962 in 2011.On the other hand, sex ratio at birth in Assam as per 2011 census was 957.

Table 21: Demographic Profile of Assam

Particulars	Value
Latitude	24 N° - 28 N°
Longitude	90 E° - 96 E°
Geographical Area (Sq. Km.)	78438
Average Rainfall (in mm)2022	2402.9
Districts [Year 2023]	33
Sub-dividions [Year 2023]	80
Blocks:	219
Revenue Circle	154
Zilla Parishad:	20
Anchalik Panchayat	189
Gaon Panchayat	2200
Towns	214
Villages	26395
Household	6406484
Total Population [Census 2011]	3,12,05,576 (2011 Census) 3,57,13,000 (2023, Projected)
Male Population [Census 2011]	159,39,443 (2011 Census) 181, 70,000 (2023, Projected)
Female Population [Census 2011]	152,66,140 (2011 Census) 175,43,000 (2023, Projected)
Rural Population [Census 2011]	268,07,034 (2011 Census) 301,56,000 (2023, Projected)
Urban Population [Census 2011]	43,98,542 (2011 Census) 55,57,000 (2023, Projected)
Sex Ratio (female per 1000 male) [Census 2011]	958
Population Density (per Sq. Km.) [Census 2011]	398
Child Population (0-6 Years) [Census 2011]	4638130
Child Sex Ratio (0-6 Years) [Census 2011]	962
Literacy Rate (%) [Census 2011]	72.19

[12]2011 Census data is used for presenting the state's demographic profile, literacy rate, etc. as the census survey was not conducted by the Govt. of India after 2011.

Particulars	Value
Literacy Rate (%) (Rural) [Census 2011]	69.34
Literacy Rate (%) (Urban) [Census 2011]	88.47
Male Literacy Rate (%) [Census 2011]	77.85
Male Literacy Rate (Rural) [Census 2011]	75.4
Male Literacy Rate (Urban) [Census 2011]	91.8
Female Literacy Rate (%) [Census 2011]	66.27
Female Literacy Rate (Rural) [Census 2011]	63
Female Literacy Rate (Urban) [Census 2011]	84.9
Birth Rate (Per 1000) [2020]	21.9
Death Rate (Per 1000) [2020]	6.2
BPL Population [Tendulkar Methodology (2011-12)]	31.98
Per Capita NSDP at Current Price (in Rs.) [2022-23 AE]	118504
Per Capita GSDP at Current Price (in Rs.) [2022-23 AE]	136819

Schedule Castes

According to the 2011 census, the population of Scheduled Castes in Assam is 1,145,314, comprising 7.15% of the overall population. Among the SC population, 81.82% resides in rural areas, while 18.18% resides in urban areas.

Table 22: Schedule Tribe Profile of Assam

	Male		Female		Total		% of Total Population
	Person	%	Person	%	Person	%	
Rural	938664	51.41	887097	48.6	1825761	81.82	6.81
Urban	206650	50.95	198910	49.0	405560	18.18	9.22
Total	1145314	51.33	1086007	48.7	2231321	100	7.15

Schedule Tribes

The aggregate population of Scheduled Tribes stands at 3,884,371, comprising 12.45% of the overall state populace. The tabulated data reveals that among the total ST population, 50.38% are male, while the remaining 49.6% are female. The majority of the ST community is primarily concentrated in rural regions, accounting for 94.36%, with only a minimal percentage residing in urban areas.

Table 23: Schedule Tribe Profile of Assam

Population (Census 2011)	3884371
Total Households	755194
Male Population (Census 2011)	1957005
Female Population (Census 2011)	1927366
Rural Population (Census 2011)	3665405
Urban Population (Census 2011)	218966
Sex Ratio (female per 1000 male) (Census 2011)	985
Sex ratio (Rural)	984
Sex ratio (Urban)	996
HH Size (Census 2011)	5.14
HH Size (Rural)	5.19
HH Size (Urban)	4.50
Literacy Rate (%) (Census 2011)	72.06
Literacy Rate (%) (Rural) (Census 2011)	70.95
Literacy Rate (%) (Urban) (Census 2011)	90.04
Male Literacy Rate (%) (Census 2011)	78.96
Male Literacy Rate (Rural) (Census 2011)	78.04

Male Literacy Rate (Urban) (Census 2011)	93.75
Female Literacy Rate (%) (Census 2011)	65.10
Female Literacy Rate (Rural) (Census 2011)	63.77
Female Literacy Rate (Urban) (Census 2011)	86.35
Total Worker (%) (Census 2011)	43.99
Total Worker (%) (Rural) (Census 2011)	44.54
Total Worker (%) (Urban) (Census 2011)	34.71
Male Worker (%) (Census 2011)	53.06
Male Worker (Rural) (Census 2011)	53.26
Male Worker (Urban) (Census 2011)	49.66
Female Worker (%) (Census 2011)	34.78
Female Worker (Rural) (Census 2011)	35.69
Female Worker (Urban) (Census 2011)	19.72

4.3.2 Road Network

Assam has a total of 55,060 km of road length excluding national highways (NH).

Table 24: Road Lenght of Assam

Sr. No	Details	Length
1.	Total Road Length excluding N.H. (in Km)	55060
2.	Surfaced (Black topped) (in Km)	32605
3.	Cement Concrete (in Km)	654
4.	National Highway (N.H.) (in Km)	3882.98
5.	Road Length per lakh of population (in Km)	163.74
6.	Road length per `00 sq. km. of Geographical Area (in Km)	75.15
7.	State Highways (in Km)	2530
8.	Major District Roads (in Km)	4379

Source: Statistical Handbook Assam 2021

4.3.3 Transport Network

Rail Transport

Assam has a well-connected rail network connecting to the rest of the country. The Northeast Frontier Railway or NF Railway is one of the 17 railway zones in India. NF Railway is headquartered in Maligaon, Guwahati. NF Railways is responsible for rail operations in the entire Northeast and parts of West Bengal and Bihar.

Road Transport

The network of national highways and other roads make travel to Assam convenient. The national highways connect Assam to the entire Northeast, Bihar, Jharkhand and West Bengal and other parts of the country. The important national highways in Assam connects with the Bangladesh, Myanmar and Bhutan and all major cities of Assam, and other states of India.

Air Transport

The Lokopriya Gopinath Bordoloi International Airport at Borjhar in Guwahati is the main airport of Assam. All major domestic flights fly in and out of Guwahati from the important cities of India. Other domestic airports are located at Jorhat, Dibrugarh, Tezpur, North Lakhimpur and Silchar in Assam. Helicopter services are also available from Guwahati to Tura, Shillong and Tawang. Druk air connects Guwahati internationally to Bangkok and Paro twice a week.

Inland Water Transport

Inland water transport plays a pivotal role in the state of Assam, enriching its transport infrastructure and connecting remote areas through an extensive network of rivers and water bodies. The mighty Brahmaputra River, which flows through the heart of Assam, serves as a natural aquatic highway. Assam boasts a vibrant system of ferry services, cargo boats, and passenger vessels that navigate the intricate waterways, providing crucial connectivity to otherwise inaccessible regions. These water routes not only facilitate the transportation of goods and people but also contribute significantly to the state's economy. The riverine landscape of Assam, with its numerous tributaries and channels, creates a unique environment where water transport serves as a lifeline for communities along the banks. The government and local authorities continue to invest in and develop the inland water transport infrastructure to enhance accessibility, boost trade, and foster economic growth in this picturesque northeastern state.

4.3.4 Literacy Rate and Education

Literacy rate in Assam has seen upward trend and is 72.19 percent as per latest population census. Of that, male literacy stands at 77.85 percent while female literacy is at 66.27 percent. In 2001, literacy rate in Assam stood at 63.25 percent of which male and female were 84.28 percent and 54.61 percent literate respectively. In actual numbers, total literates in Assam stands at 19,177,977 of which males were 10,568,639 and females were 8,609,338.

Table presents the status of education infrastructure and facilities in the state.

Table 25: Status of Education infrastructure in the State

S. No	Item	Nos.
Elementary Education Institution		
1.	No of Primary School	34482
2.	No of Upper Primary School	5805
3.	No. of High School	3441
4	Higher Secondary School	771
Higher Education Institution		
7.	University (Private + Govt.)	20
8.	Government Colleges	4
9.	Provincialized Colleges	321
10.	Non-Govt. Colleges	92
Junior College		63
11.	Agriculture & Forestry College	7
12.	Veterinary	4
13.	Law College (Govt. & Non-Govt.)	27

Source: Statistical handbook of Assam, 2022

The State Government, in order to provide and promote quality education, attract children of all social groups, and also see to the implementation of various Central Government schemes and programmes, the following facilities are provided through Directorate of Elementary Education (DEE):

- Mid-day Meal for students of primary and upper primary schools.
- Teaching Learning Materials (TLM) to Government and Provisional Schools.
- Provision of free textbooks up to Class VIII to all categories of schools, including institutions not receiving financial assistance.
- Provisions of scholarships to SC, ST, disabled children and meritorious students.
- Provision of uniforms to students up to Class VIII level

4.3.5 Health Infrastructure

The status of Health infrastructure in the State has been improving over the years. There are 25 Civil Hospitals, 14 Sub-Divisional Civil Hospitals, 850 PHCs, 13 FRUs, 201 CHCs and 4690 Sub Centres, with 21475 numbers of total beds in the State at the end of 2022. The number of Medical and Paramedical staff in the state is 13759, including Ayurvedic and Homeopathic doctors. The status of health infrastructure is presented in the table below.

Table 26: Status of Health infrastructure in the State

S No	Item	Nos
1.	Government Hospitals	25
2.	Primary Health Centre	850
3.	Sub-division Civil Hospital	14
4.	Sub-centres	4690
5.	Community Health centre	201
6.	MBBS Doctors (Govt. + NHM)	3052
7.	Specialist Doctors (Govt. + NHM)	1022

Source: Statistical handbook of Assam, 2022

The State is implementing Health Sector Schemes both in the urban and rural areas to provide healthcare facilities at free and at affordable cost. Some of the schemes being implemented in the State are as follows:

- Primary health cares both in rural and urban areas.
- Secondary health care
- Ayush
- Control of communicable diseases
- Non-communicable diseases
- Schemes for food safety measures
- Public health education v School health services
- Assam Bikash Yojana
- National Fluorosis Control Programme
- Pilot project for prevention of burn injuries
- Indra dhanush
- Atal Amrit Abhiyan- Health Insurance Scheme

4.3.6 Electricity, Water and Sanitation Facilities

Over 78% of households currently enjoy access to electricity, with a notable disparity between urban and rural areas. Urban households boast a higher prevalence, with 96% benefiting from this essential utility, compared to 75% in rural settings. Moreover, a substantial 84% of households have adopted improved sources for drinking water, including piped water into their dwellings or yards, public tap/standpipe usage, as well as tube wells or boreholes. A commendable 89% of households have convenient access to sanitation facilities, indicating a positive trend in promoting hygienic practices. However, there remains a concerning 11% of households where open defecation persists, primarily observed in rural areas (13%) as opposed to urban locales (1%). (Source: NFHS-4, 2015-16).

4.3.7 Cultural Resources of Assam

Assam serves as a unique confluence of diverse cultures, where the inhabitants of this captivating state are a blend of various racial backgrounds, including Mongoloid, Indo-Burmese, Indo-Iranian, and Aryan influences. Referred to as "Asomiya" (Assamese), the indigenous people of Assam not only embody a rich cultural tapestry but also communicate in the state language, Assamese. The region boasts a multitude of tribes, each distinguished by its own set of traditions, cultural practices, distinctive attire, and a fascinating way of life. Among the diverse tribes present in Assam are the Bodo, Kachari, Karbi, Miri, Mishimi, Rabha, and more, each with its unique language. While the majority of Assamese adhere to Vaishnavism, a sect of Hinduism, the state is also home to followers of Buddhism, Christianity, Hinduism, Islam, and other faiths. The focal point of Assam's cultural celebration is the Bihu festival, observed in three distinct phases throughout the year. Beyond its cultural diversity, Assam has a longstanding tradition of craftsmanship. Over the ages, artists, sculptors, masons, weavers, spinners, potters, goldsmiths, and artisans skilled in working with ivory, wood, bamboo, cane, and hide have thrived in Assam, contributing to the region's rich artistic heritage.

4.3.8 Archaeological and Historical Monuments

The Ancient Monuments and Archaeological Sites and Remains Act, 1958 (ACT No. 24 of 1958) and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010 ensures the preservation of ancient and historical monuments and archaeological sites and remains of national importance, for the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects.

Assam, a northeastern state of India, boasts a rich tapestry of archaeological and historical monuments that bear witness to its diverse and culturally vibrant past. The region is adorned with ancient temples, each telling a story of architectural marvel and religious significance. Notable among these is the Kamakhya Temple, an ancient Hindu pilgrimage site dedicated to Goddess Kamakhya. The Ahom-era monuments, such as the Rang Ghar and Kareng Ghar in Sivasagar, reflect the architectural prowess of the Ahom dynasty. Majuli, the world's largest river island situated in the Brahmaputra, is home to Vaishnavite monasteries known as ‘Satras’, which are repositories of Assamese art and culture. Additionally, the impressive archaeological remains at Tezpur, such as Agnigarh and Bamuni Hills, add further layers to Assam's historical narrative. These monuments collectively stand as guardians of Assam's cultural heritage, inviting visitors to explore the fascinating chapters of its past.

Chapter 5: Model ESIA and Environmental and Social Impacts and Mitigation Measures

As the demand for dependable and eco-friendly energy transmission escalates, it becomes imperative to address the intricate environmental and social risks that may arise. This chapter outlines potential impacts at different stages of construction (Pre-construction, Construction, and Operation) and proposes mitigation strategies to mitigate or prevent such impacts. In assessing the potential environmental and social risks associated with the subprojects and transmission lines under the "Assam Intra State Transmission System Enhancement Project" (Phase-II), a meticulous and multi-faceted approach has been adopted.

A Model Environmental and Social Impact Assessment (ESIA) has been conducted to strengthen the generic ESMP in this ESMPF. The model ESIA not only serves as a guide for identifying environmental and social risks envisaged in the generic ESMP, but also as a blueprint for implementing effective mitigation measures, ensuring that these critical energy projects align with principles of environmental consciousness and social accountability and therefore provide better guidance in project implementation.

5.1 Environmental and Social Profile of Sites Visited

Baseline profiling of subprojects adheres to ESP's approach for environmental and social management. This involves identifying strategies to avoid, minimize, mitigate, offset, or compensate for the environmental and social impacts of the project. It necessitates assessing potential substation sites and associated transmission line routes to select the least impactful route, aiming to avoid disturbance to forests, biodiversity, eco-sensitive zones, animal/bird migration paths, protected areas, natural habitats, cultural and historical sites, common property resources, structures, and vulnerable communities as much as possible from the project's conceptualization and planning stages. Additionally, this process aids in proposing the installation of tall towers early on to mitigate impacts. The baseline assessment also determines the necessity for additional studies by independent agencies to understand impacts better and plan management measures to minimize or mitigate such impacts.

The methodology utilized for establishing baseline data encompasses gathering information on current conditions across various domains including physical, ecological, economic, and social aspects. This includes assessing both existing and anticipated environmental and social impacts, along with proposed mitigation measures. In evaluating the physical, biological, and social characteristics along the proposed substation and transmission line route, data collection was conducted from secondary sources to complement findings from field surveys.

A baseline study was undertaken to evaluate the environmental and socio-economic conditions within the substation premises, adjacent areas, and the vicinity of the proposed transmission line corridor. This involved generating baseline data through a combination of field observations, survey reports, and engagement with both the local community and project personnel.

Out of 14 proposed new substations and 14 associated transmission lines, site visit and consultations were carried out at 7 substations (50% of the locations) to establish the E&S baseline. Since, route survey of only 7 out of 14 transmission line routes were carried out, these primary route survey reports were considered to establish E&S baseline for the 7 transmission lines (50% of the associated transmission lines).

5.1.1 Environmental and Social Profile of the proposed Substations

More precisely, site visits and consultation were carried out for 7 out of the 14 nos. of proposed substation locations to facilitate a comprehensive grasp of the environmental and social considerations associated with the construction and operation of these crucial infrastructure elements. The Environmental and Social observations of the site visit are presented in the **Table 27**. The detailed Environmental and Social Screening Checklists along with site visit photographs are provided in **Appendix 5**.

Table 27: Environmental and social profile of the Substations

Sr. No.	Name of Substation and T/L	Name of the Division	Environmental and Social profile
1	New 132/33 kV (2X50 MVA) AIS Substation at Dhing	Nagaon T&T division	• 15 bighas of AIDC land (Govt.) identified and land has been transferred to the name of AEGCL. • The land is free from any legal encumbrances and no encroachers and squatters were identified within the proposed site. • No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land. • No trees required to be felled except clearing of shrubs and bamboo clumps. • Demolition of abandoned structures may be required. • A Beel named *Lettriebeel* is located adjacent to the proposed land. • Utility structures like water pipes and poles needs to be removed.
2	New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara	Mirza T&T Division	• 25 bighas of AIDC land (Govt.) has been transferred to the name of AEGCL. • The land is free from any legal encumbrances and no encroachers and squatters were identified within the proposed site. • No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land. • The proposed land is surrounded by the residential areas. • Presence of water bodies such as ponds near the proposed land.
3	New 132/33 kV (2 X50 MVA) AIS Substation at Morigaon	Narengi T&T Division	• 15 bighas, 2 Katha and 10 Lessa of land has been identified and transferred to the name of AEGCL. • One Lower Primary school is near to the proposed land and during implementation of the project, proper consultation and precautionary measure would be required. • The land is free from any legal encumbrances and no encroachers and squatters were identified within the proposed site. • No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land. • The proposed land is a low-lying area. Proper backfilling and compaction might be required. • Presence of agricultural land near the site. • Tree cutting/clearance of vegetation is required. • Utilities: Presence of 132kV tower with a D/C Line within

Sr. No.	Name of Substation and T/L	Name of the Division	Environmental and Social profile
			the land, and 2 nos. newly constructed 33kV four-pole.
4	New 132/33 kV (2X 50 MVA) AIS Substation at Serfanguri	Dhaligaon T&T Division	• 25 bighas of Government land identified and has been transferred to the name of AEGCL. • The land is free from any legal encumbrances and no encroachers and squatters were identified within the proposed site. • No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land. • No trees required to be felled except clearing of shrubs. • *River Hel* is flowing approximately 1.3 km away from the proposed site. • No utility structures found at the site.
5	New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor	Garmur, Jorhat T&T Division	• 9 bighas of Tea Graden land of M/s Letekujan Tea Estate has been identified and acquired by AEGCL for construction of the new 132/33kV Titabor S/S. and land has been transferred to the name of AEGCL. • The land is an unused land within the tea garden and no structures were found in the land • The land is free from any legal encumbrances and no encroachers and squatters were identified within the proposed site. • No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land. • No trees required to be felled except clearing of shrubs. • Utility structures like electrical poles needs to be shifted from the site. • Hilikha Tea Estate is located within the vicinity of the proposed site.
6	New 220/132 kV (2X160 MVA) GIS Substation at Rowta	Depota T&T Division	• The proposed 220/132kV Rowta S/S will be constructed in the existing land of the 132/33kV Rowta S/S of AEGCL. • Hence no new land for the proposed S/S is required and the existing land of AEGCL is fully demarcated and no land issues identified here. • No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land. • Some trees may be required to be felled. • Demolition of abandoned structures may be required. • Utility structures like water pipes and electric poles needs to be removed.
7	New 132/33 kV (2X50 MVA) GIS Substation at Lumding-	Samaguri T&T Division	• 8 bighas of Government land identified and has been transferred to the name of AEGCL. • The land is free from any legal encumbrances and no encroachers and squatters were identified within the proposed site. • AEGCL also requires additional 1 Katha and 16 lessa of land to construct the approach road to access the propose Lumding S/S. The required 1 Katha 16 Lessa of land was private land earlier and the land is acquired by AEGCL through New Land Acquisition Act, 2013 and payment has been made to the Land owners accordingly. • No environmentally sensitive areas, protected areas,

Sr. No.	Name of Substation and T/L	Name of the Division	Environmental and Social profile
			cultural heritage sites are present within the vicinity of the proposed land. • Some trees may require to be felled.

5.1.2 Environmental and Social profile of the proposed Transmission Lines

In contrast, the environmental and social considerations of transmission lines incorporated a blend of remote sensing investigations, route surveys, and GIS analysis (**Appendix 6**). Route surveys were carried out by surveyors from AEGCL for 50% of the transmission lines (7 out of 14), providing essential data for subsequent analysis. GIS analysis was applied to KML (Keyhole Markup Language) files generated from the surveys to pinpoint crucial and sensitive locations like major water bodies (wetlands, rivers, lakes, ponds and swamp area), biodiversity hotspots (national parks, sanctuaries and reserved forest) and flora and fauna crossings along the designated routes.

Table 28: Environmental and social profile of the Transmission Lines

Sl. No.	Name of Transmission Line	Environmental and Social profile
1.	**132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding**	• The total length of the selected route is **39.707** Km. • This proposed route will pass through the Shankardev Nagar, Pamgaon, Paschim Bhalukmari, Dakshin Baluhandar, Kashipur, Paschim Lanka, Lankagaon, Lankapatti, Punjabi Basti, Nangaldanga, PanchBhandar, Maska, Guwagaon, Mailu Basti, Disha, Dishai (Bihari Basti), 12no Kao, 4 No Nayabir, Manipuri Basti, Rank Khar Bil, Shibpur Basti, Lumding and Jaramdisa Villages. • A segment of the proposed T/L measuring 6.36-kilometre traverses through Lumding Reserve Forest (Marat Logri) and LungtingMupa Reserve Forest. The request for forest clearance has been submitted to PARIVESH, Ministry of Environment, Forest and Climate Change (MoEF&CC) on 19th December 2023. The In Principle approval (Stage-1) of the proposal was received on 30th Jan 2024 and the Final approval (Stage-2) is under process. • The soil condition between Sankardeb Nagar and Lumding areas tends to be fertile in nature. This terrain lies in the plain zone of the State and the topography in general is plain. The crops being grown in the corridor are mainly Paddy some portions are used for vegetables. About 65% of the land which is plain is used for cultivation purpose. • The proposed route crosses the Lumding River thrice at various places, Crosses NEF Railway near Paschim Bhalukmari&Lumding village, and State Highway near Lankagaon village.
2.	**220kV Rowta (New) - New Rangia (Tamulpur) D/C Line**	• The length of the selected route is **69.238** km. • This route will pass through the 42 Numbers of villages viz. No. 1 Phuharabari, Barigaon, No-2 Batabari, Sonaibhar Gaon, No.1 Gormara, No-1 Batabari, Ballagaon, Khator Bari, Darangi Para, Bhaluk Mari, Maijlipara, Kalbari, Boscobari, Sastrapara, Kahibari, Khokha Gaon, Batachuchi, Chenipara, Khatowalpara, Ratanpur, Belguri, Murmela, Bhupguri, Dingdongpara, No-1 Singibari, Galachuba, Bura Pujasali, Jabangapathar, No.3 Darogachuba, Ghorashal, Khasiachuba, Nalabari, Dhupguri, Batabari, No-2 Jalthengpar, Suwagpur, No.1 Suwagpur, Dowa Makha, Baraliapar, Fehuwajhar, Majgari and Ramechuburi. • This route does not pass through any forest land or protected

Sl. No.	Name of Transmission Line	Environmental and Social profile
		area. • The identified alignment crosses 800 KV HVDC BNC-AGR T/L twice, 400 KV Balipara- Bongaigaon once, and 132KV S/C Rangia-Deothang T/L once. Further, the identified line will cross a few LT lines & 11kv lines at various places. • The proposed route will also cross a few RCC roads, metal roads & village roads at various locations. • The proposed route crosses Jai Dhansiri, Daiphong, Bega, Sapkhaiti, Chandana, Bikhaiti, Bhuthimarai, Kulsi, Sanajili, Nanai, Sukai, Puthimari and Baralia river at various places. In addition, there are some water bodies, drains, and canals in this route.
3.	**132kV Serfanguri (New) - Gossaigaon (Existing) D/C Line at Serfanguri**	• The length of the proposed route is **19.358** Km. • The proposed route will pass through the village Dhauliguri, Hudumkhata-1, Anthaibari, Odlaguri-1, Haraputa, Alinagar-1, Kaimari, Simlaguri-2, Gambaribil, Sinsilibri, Gombari Guri, Oxiguri, Kalyankhuti, DolorPathar and Athiabari. • This route does not pass through any forest land or protected area. • The identified alignment has eight numbers of river crossings at various places. • That proposed route has crossing of 800KV Biswanath Chariali to Agra T.L at Haraputa village, 400KV Siliguri to Salakati T.L crosses thrice at Dhauliguri, Hudumkhata-1 and Odalguri-1 village and 400 KV Salakati to NJP T.L at Odalguri-1 village, and 132KV Joyma to Dhaligaon T.L at Dhauliguri village.
4.	**132kV Dhing (New) - Khaloigaon (Existing) D/C Line**	• Total Length of this route is **28.962** km. • This route passes through Gohaibari, Bhalukmari, Bamun Bari, Bhakat Gaon, EtakaliSabukdhara, Parali Guri, Mikirbheta Circle, Bora Bazar, Silpukhuri, Tuk Tuki, Lalana Bari, Baruati, Saharia Gaon, DhupaguriKachari Gaon, Auniati Kheraj, BengenaAti, Auniati Satra, Bilatia, Mohokhuti, and AthgaonChapari village. • This route does not pass through any forest land or protected area. • The identified alignment will cross the Leteri River thrice at various places (near village Leteri, Bilotia and Itakoli). • The route has one NF Railway crossing and three numbers of National & State Highway Crossing.
5	**LILO of 132KV Pailapool (Existing) -Srikona (Existing) Line at Udarbond**	• The total length of the selected route is **0.952** km. • This proposed route will pass through Arkatipur and Chappanahal villages. • This route does not pass through any forest land or protected area. • The proposed route has no river crossing, the route will cross a PWD road at Arkatipur village and a village road in Chappanahal village.
6	**132kV Titabor (New) - Mariani (Existing) D/C Line**	• The total length of the proposed route is **8.763** km. • This route passes through Nabajyoti gaon, Heeleakha tea state and Nagadholi tea state. The proposed route passes through 6.02km Tea Garden areas. • This route does not pass through any forest land or protected area. • The proposed route has no river crossing. Although there are a few water bodies, drains, and canal in this route. • The proposed route has one State Highway Crossing and one 132 KV D/C transmission Line.

Sl. No.	Name of Transmission Line	Environmental and Social profile
7	**LILO of 132 KV Tinsukia (Existing) -Dibrugarh (Existing) S/C Line**	• The total length of the selected route is **1.402** km. • This route passes through the village Amguri Gaon. • This route does not pass through any forest land or protected area. • The proposed route passes through 1.05 km of Tea Garden areas. • The proposed route crosses the state highway Chabuwa – Tengakhat Road in the village Amguri Goan.

5.1.3 Biodiversity Assessment for Proposed Substation and Transmission Lines

In accordance with the guidelines set forth by the Government of India and the Asian Infrastructure Investment Bank (AIIB), the biodiversity assessment forms an integral component of the Model ESIA for the proposed Transmission Lines and Substations under the AISTSEP Phase-II. As mandated by the Government of India[13], any proposal involving the use of an area exceeding 50 hectares within a sanctuary or national park requires a comprehensive biodiversity impact assessment study report, accompanied by suggested mitigation measures prepared by a government-accredited agency. Similarly, AIIB's Environmental and Social Framework emphasizes the importance of assessing potential adverse effects on protected areas, prioritizing avoidance or effective mitigation measures to uphold conservation goals and integrity, and ensuring compliance with national laws.

Leveraging the IBAT (Integrated Biodiversity Assessment Tool) analysis conducted for all of the 14 proposed sub-projects, the biodiversity assessment aims to evaluate the project's potential impacts on key biodiversity areas (KBAs) and important bird areas (IBAs), and propose measures to minimize adverse effects, preserve biodiversity, and uphold environmental sustainability. However, the proposed Transmission Lines where route surveys are yet to be conducted, BEE lines were considered for IBAT assessment. This approach facilitated a comprehensive evaluation of potential impacts, even in instances where direct route surveys were not conducted. The outcome of the IBAT assessment is provided in **Table 29** and the IBAT Maps along with the Biodiversity Action Plan is provided in **Appendix 7.**

Table 29: Outcome of IBAT Assessment for Proposed Substations and Transmission Lines

Sl. No.	Name of the Proposed S/s and T/L	Result of IBAT Assessment
Transmission Lines identified by Route Survey[14]		
1	New 132/33 kV (2X50 MVA) GIS Substation at Lumding	The proposed Substation location falls within 5 km radius of 2 nos. of KBA Sites, namely Langting Mupa RF and Lumding Marat Logri RF.
	Associated T/L: 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding	The proposed T/L passes through 2 nos. of KBA Sites, namely Langting Mupa RF and Lumding Marat Logri. **Forest Clearance**: The request for forest clearance has been submitted to PARIVESH, Ministry of Environment, Forest and Climate Change (MoEF&CC) on 19th December 2023. The In-Principle Approval (Stage-1) of the proposal was received on 30th Jan 2024 and the Final approval (Stage-2) is under process. During the preparation of Site-specific ESIA-ESMP report, Biodiversity Assessment should be carried out

[13] https://moef.gov.in/wp-content/uploads/2022/05/scan_1_20220513123225097.pdf

[14] The route survey has been conducted for 7 Transmission Lines out of 14 Transmission Lines and the IBAT assessment has been carried out considering the identified surveyed routes.

Sl. No.	Name of the Proposed S/s and T/L	Result of IBAT Assessment
		and an action plan should be prepared and followed during the construction and operation phase of the Substation and Transmission Line. A sample **Biodiversity Action Plan** is appended in **Appendix 7.**
2	New 220/132 kV (2X160 MVA) GIS Substation at Rowta	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 220kV Rowta (New) - New Rangia (Tamulpur) D/C Line	Key Biodiversity Areas not identified within RoW of the proposed identified route for Transmission Line
3	New 132/33 kV (2X 50 MVA) AIS Substation at Serfanguri	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 132kV Serfanguri (New) - Gossaigaon (Existing) D/C Line at Serfanguri	Key Biodiversity Areas not identified within RoW of the proposed identified route for Transmission Line
4	New 132/33 kV (2X50 MVA) AIS Substation at Dhing	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 132kV Dhing (New) - Khaloigaon (Existing) D/C Line	Key Biodiversity Areas not identified within RoW of the proposed identified route for Transmission Line
5	New 132/33 kV (2X50 MVA) AIS Substation at Udarbond (Silchar-2)	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: LILO of 132KV Pailapool (Existing) -Srikona (Existing) Line at Udarbond	Key Biodiversity Areas not identified within RoW of the proposed identified route for Transmission Line
6	New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 132kV Titabor (New) - Mariani (Existing) D/C Line	Key Biodiversity Areas not identified within RoW of the proposed identified route for Transmission Line
7	Establishment of new 132/33 kV (2 X 50 MVA) AIS Substation at Chabua	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: LILO of 132 KV Tinsukia (Existing) -Dibrugarh (Existing) S/C Line	Key Biodiversity Areas not identified within RoW of the proposed identified route for Transmission Line
BEE Lines[15]		
8	New 132/33 kV (2 X 50 MVA) AIS Substation at Agamoni	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 132 kV LILO of Gossaigaon - Gauripur S/C (Existing) Line at Agamoni (New)	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line
9	New 220/33 kV (2X100 MVA) GIS Substation at Boragaon (Jalukbari)	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 220 KV Boragaon (Jalukbari)(New) - Kukurmara (Existing) D/C Line	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line
10	New 220/33 kV (2X100 MVA) GIS Substation at Panjabari	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: LILO of 220kV Sonapur-Sarusajai (Existing) -S/C Line at Panjabari	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line
11	New 132/33 kV (2X50 MVA) GIS Substation at Zoo Road	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: LILO of 132kV Kahilipara (existing) – Narengi (existing) S/C line at Zoo Road	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line
12	New 132/33 kV (2 X50 MVA) AIS	The proposed Substation location does not fall within 5

[15] The proposed Transmission Lines where route surveys are yet to be conducted, BEE lines were considered for IBAT assessment.

Sl. No.	Name of the Proposed S/s and T/L	Result of IBAT Assessment
	Substation at Morigaon	km radius of Key Biodiversity Areas
	Associated T/L: 132kV Morigaon (New) – Baghjap (Existing) D/c line	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line
13	New 132/33 kV (2 X 50 MVA) AIS Substation at Amayapur	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 132kV Amayapur (New) - Hajo (Existing) D/C Line	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line
14	New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara	The proposed Substation location does not fall within 5 km radius of Key Biodiversity Areas
	Associated T/L: 132kV Dhupdhara (New) - Boko (Existing) D/C Line	Key Biodiversity Areas not identified within RoW of the BEE Line for Transmission Line

The important KBA and IBA nearby the proposed 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding are:

KBA near 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding

- **Lumding Reserve Forest**

Lumding Reserve Forest (RF) spans 22,403 hectares and serves as a crucial wildlife habitat in Assam's Nagaon district. It extends through the Lanka and Lumding ranges of the Nagaon South Forest Division and was designated as part of the Dhansiri-Lumding Elephant Reserve in 2003. The topography of the terrain within the Lumding RF is semi-hilly and densely vegetated. Lumding RF is strategically connected to the Marat-Longri Wildlife Sanctuary (WLS) in the KarbiAnglong district to the east and to the Langting-Mupa Reserve Forest in the North Cachar Hills district to the west.

This RF possess a rich variety of major forest species, each contributing to the ecological and economic value of the region. Key tree species include Teak (*Tectona grandis*) and Sal (*Shorea robusta*), both known for their high-quality timber. These trees are often found alongside associates such as Arjuna (*Terminalia arjuna*). In addition to these dominant trees, the forests also support a range of shrubs and medicinal plants. Notable medicinal species include *Amla (Phyllanthus emblica*), Arjun (*Terminalia arjuna*), and Neem (*Azadirachta indica*), all of which are valued for their therapeutic properties. The forests also produce a variety of bamboo species, such as Pahari Jati Bah (*Oxytenanthera parvofolia*) and Dulu Bah (*Schizostachyum dullooa*), which are important for local livelihoods and traditional crafts.

This extensive forest corridor is a vital migration route for numerous wildlife species, particularly Asian elephants (*Elephas maximus*). Elephant herds from central and southern Karbi Anglong migrate westward toward the forests of North Cachar Hills, Nagaon, and the western part of KarbiAnglong, and vice versa, through this forest. A diverse array of wildlife inhabits Lumding RF, with 37 species of mammals recorded. Key species include the Bengal tiger (*Panthera tigris*), Asian elephant (*Elephas maximus*), clouded leopard (*Neofelis nebulosa*), western hoolock gibbon (*Hylobates hoolock*), Indian bison (*Bosgaurus*), barking deer (*Muntiacus muntjak*), and sambar (*Rusa unicolor*). The White-winged Duck (*Cairina scutulata)* has been recorded in Lumding RF.

- **Lanting Mupa Reserve Forest**

LangtingMupa Reserve Forest (RF) is predominantly covered by semi-evergreen forest, which occupies approximately 51.29% (30,992.55 hectares) of its area. The reserve also includes 2.97% (1,797.75 hectares) of moist-deciduous forest and 32.16% (19,435.17 hectares) of mixed bamboo vegetation. Historically, the past working plan reports and standard literature indicate that

Langting Mupa RF was primarily covered by moist-deciduous forest. Over time, there has been a significant transition from moist-deciduous to semi-evergreen forest within the reserve. There is no single dominant species across the entire reserve forest, except in plantation areas where Teak (*Tectona grandis*) is grown. The forest types within this IBA include tropical moist deciduous and tropical semi-evergreen forests. Abandoned jhums (areas previously subjected to slash-and-burn cultivation) are now covered with various grasses such as *Themeda villosa, Saccharum procerum, Imperata cylindrica, Eupatorium odoratum*, and shrubs. The Forest Department has also established plantations, primarily featuring Teak (*Tectona grandis*), *Gmelina arborea*, and *Albizzia procera*.

- **Marat Longri Wildlife Sanctuary**

Marat Longri Wild Life Sanctuary was established on 17th April 2003 with a geographical area of 451.00 km^2. The sanctuary comprises four Reserved Forests (RF); namely - Mijungdisa RF, Disama RF, Kaki RF and Inglongkiri RF. The sanctuary is an integral part of Dhansiri-Lumding elephant reserve and the famed Inglongkiri sacred grove. The sanctuary's vegetation is predominantly sub-tropical, featuring a wide array of tree species, shrubs, climbers, and bamboo. Key tree species in the region include Amari or Lali (*Amoora wallichii*), Amloki (*Emblica officinalis*), Amora (*Spondias mangifera*), Bogipoma (*Chukrassia tabularis*), and Bhelu (*Tetrameles nudiflora*). Other significant species are Borpat (*Ailanthus grandis*), Cham (*Artocarpus chaplasha*), Dimaru (*Ficus glomerata*), Gendeli Poma (*Dysoxylum hamiltonii*), Ghogra Neem (*Melia azedarach*), Hatipoila (*Pterospermum acerifolium*), Hilikha (*Terminalia chebula*), and Hollock (*Terminalia myriocarpa*). Understory vegetation includes notable shrubs such as *Eupatorium odoratum, Laportea crenulata, Alpinia allughas*, and *Litsea salicifolia*. Prominent climbers include *Mezonuruon cucullatum, Embelia ribes, Acacia pinnata, Mikania scandens,* and *Zizyphus rugosa*.

The sanctuary is home to a diverse range of mammals, including Asian elephant, royal Bengal tiger, and leopard. Other significant mammals include the marbled cat, Indian bison, Himalayan black bear, sambar, barking deer, hog deer, and the Hoolock gibbon. Various primates such as Assamese macaques, pig-tailed macaques, stump-tailed macaques, and the slow loris are also present. Additionally, the region hosts the serrow and flying squirrel, highlighting its rich mammalian biodiversity.

The avifauna of the region is rich with approximately 400 bird species recorded. Notable bird species include the Wreathed Hornbill (*Duabanga sonneratoides*), Rufous-necked Hornbill (*Aceros nipalensis*), Great Pied Hornbill (*Bucerosbicornis*), and Indian Pied Hornbill (*Anthracocerosmalabaricus*). Other significant birds are the Red Jungle Fowl (*Gallus gallus*), Khaleej Pheasant (*Lophuraleucomelana*), Peacock Pheasant (*Polyplectronbicalcaratum*), White-winged Wood Duck (*Cairina scutulata*), Blyth's baza (*Aviceda jerdoni*), Crested Serpent Eagle (*Spilornis cheela*), and Black Crested Baza (*Aviceda leuphotes*) are also prominent. The reptilian diversity includes the python, king cobra, monitor lizard, and keeled box turtle. However, comprehensive data on amphibians is limited due to a lack of extensive studies in this area.

IBA near 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding

- The Lumding - Marat Longri Important Bird Area (IBA) spans Marat Longri Wildlife Sanctuary (45,100 hectares) in KarbiAnglong district and Lumding Reserve Forest (22,300 hectares) in Nagaon district, covering parts of central Assam. This area represents a significant habitat for a diverse array of flora and fauna. This IBA is home to approximately 240 bird species. Notable species include the White-winged Duck (*Cairina scutulata*), recorded in both Marat Longri Wildlife Sanctuary and Lumding Reserve Forest, and historically near Kaki Reserve Forest in Nagaon district. The Green Peafowl (*Pavomuticus*) was once common along the riverbanks but is

no longer seen in the area. Hornbills are well-represented, with the Oriental Pied (*Anthracoceros albirostris*), Great Pied (*Buceros bicornis*), and Wreathed Hornbill (*Aceros undulatus*) being common. Other significant bird species include the White-cheeked Hill Partridge (*Arborophila atrogularis*), Grey Peacock Pheasant (*Polyplectron bicalcaratum*), Black-backed Forktail (*Enicurus immaculatus*), Himalayan Golden-backed Woodpecker (*Dinopium shorii*), and Sultan Tit (*Melanochlora sultanea*).

- The IBA also supports a variety of mammal species, including several primates such as the Hoolock Gibbon (*Hylobates hoolock*), Capped Langur (*Trachypithecus pileatus*), Rhesus Macaque (*Macaca mulatta*), Pig-tailed Macaque (*M. nemestrina*), Assamese Macaque (*M. assamensis*), Stump-tailed Macaque (*M. arctoides*), and Slow Loris (*Nycticebus coucang*). It is also a critical habitat for the Asian Elephant (*Elephas maximus*), designated as an Elephant Reserve under Project Elephant. The area hosts large predators like the Tiger (*Panthera tigris*), Leopard (*P. pardus*), and Clouded Leopard (*Neofelis nebulosa*), as well as smaller cats such as the Leopard Cat (*Prionailurus bengalensis*) and Jungle Cat (*Felis chaus*). Other notable mammals include the Wild Dog (*Cuonal pinus*) and Asiatic Black Bear (*Ursus thibetanus*). Herbivores in the area include the Gaur (*Bos frontalis*), Serow (*Nemorhaedus sumatraensis*), Sambar (*Cervus unicolor*), Barking Deer (*Muntiacus muntjak*), and Malayan Giant Squirrel (*Ratufa bicolor*). The nocturnal Binturong (*Arctitis binturong*) is also found in the dense parts of the forest. Among reptiles, the Keeled Box Turtle (*Pyxides mouhotii*) has been reported in this IBA.

5.2 Anticipated Environmental and Social Impacts

Environmental impacts can be categorized as either primary or secondary. Primary impacts directly stem from the project itself, while secondary impacts are consequences induced or associated with the primary impacts. The following assessment was undertaken to identify the impacts and risks.

- Identify and evaluate the range of potential impacts and the extent of severity.
- Suggest viable mitigation measures for the identified impacts.
- Develop an Environment and Social Management Plan based on the proposed mitigation measures.

The project's environmental ramifications encompass aspects like air and noise emissions, contamination of ground and surface water, effects on local biodiversity, and the disposal of construction and demolition waste. Social impacts are associated with potential loss of property and income for landowners, changes in accessibility and irrigation drainage systems, as well as other beneficial impacts like availability of improved and reliable power supply, revenue/income generation, opening of new small- and large-scale industry, employment generation, enhancement of education and health sector etc. Further impact evaluation has been done in depth based on proposed specific project activities (substation construction and erection & stringing of transmission lines) including pre-construction, construction and operational stages.

AEGCL, in the course of project execution, adopts comprehensive precautionary measures to safeguard against any adverse impact on environmental and social (E&S) parameters. This involves conducting thorough surveys and formulating master plans for substations and associated transmission lines, with a commitment to identifying and addressing potential environmentally and socially sensitive sites, areas, and issues. In the event of unexpected environmental and social challenges arising during project implementation, AEGCL is committed to promptly taking corrective action. This includes the implementation of mitigation measures based on optimal technical solutions, all of which will be diligently documented in the Environmental and Social (E&S) monitoring reports.

5.2.1 Significance of Identified Impacts

The environmental and social risk identification and impact assessment for the sub-projects under AISTSEP Phase-II, extends beyond initial studies, for which a detailed stage wise analysis of construction activities was carried out. This detailed examination, coupled with the use of an impact significance matrix, provides a robust framework to comprehend and manage the intricacies linked to the civil works of the project and their potential environmental and social impacts. The impact significance matrix which typically involves evaluation of the magnitude of the impacts and the sensitivity of the affected receptors, is presented below:

Magnitude of Impact[16]	Sensitivity of Receptors[17]	Significance
Major	Major	High
Major	Moderate	Moderate
Moderate	Major	Moderate
Moderate	Moderate	Minor
Minor	Minor	Minimal

Interpretation		
High Significance	**Moderate Significance**	**Minor Significance**
Impacts with major significance have a very high magnitude and affect receptors that are highly sensitive. These impacts may have significant and long-lasting consequences on the environment.	Impacts with moderate significance have a high magnitude but affect receptors with a moderate level of sensitivity. These impacts may have noticeable consequences but might be more manageable.	Impacts with minor significance have a minor magnitude and affect receptors with minor sensitivity. These impacts may have minimal adverse effects and are typically more easily mitigated.

5.2.2 Impact Significance Matrix

The primary objective of this assessment is to ensure that the construction activities of Grid Substations and Transmission Lines adhere to environmental regulations, minimize negative impacts on ecosystems, and address social concerns. The assessment follows a multi-faceted approach that integrates environmental and social considerations throughout the construction process. It involves a thorough examination of each construction stage, identifying potential impacts on physical resources, ecosystems, and local communities. The methodology considers both the magnitude of impact and the sensitivity of receptors to categorize the significance of identified risks.

The construction of Grid Substations and Transmission Lines involves a series of activities, from initial surveys to final commissioning. Each stage has been carefully analysed to identify potential risks and their significance.

[16] *The magnitude of impacts has been categorized as major, moderate, minor or minimal, based on consideration of parameters such as: (i) duration of the impact; (ii) spatial extent of the impact; (iii) reversibility; (iv) likelihood; and (v) legal standards and established professional criteria.*

[17] *The sensitivity of E&S receptors (a parameter that may be affected by the project) has been determined based on review of the local population (including proximity/numbers/vulnerability) and presence of features at the project sites or the surrounding area.*

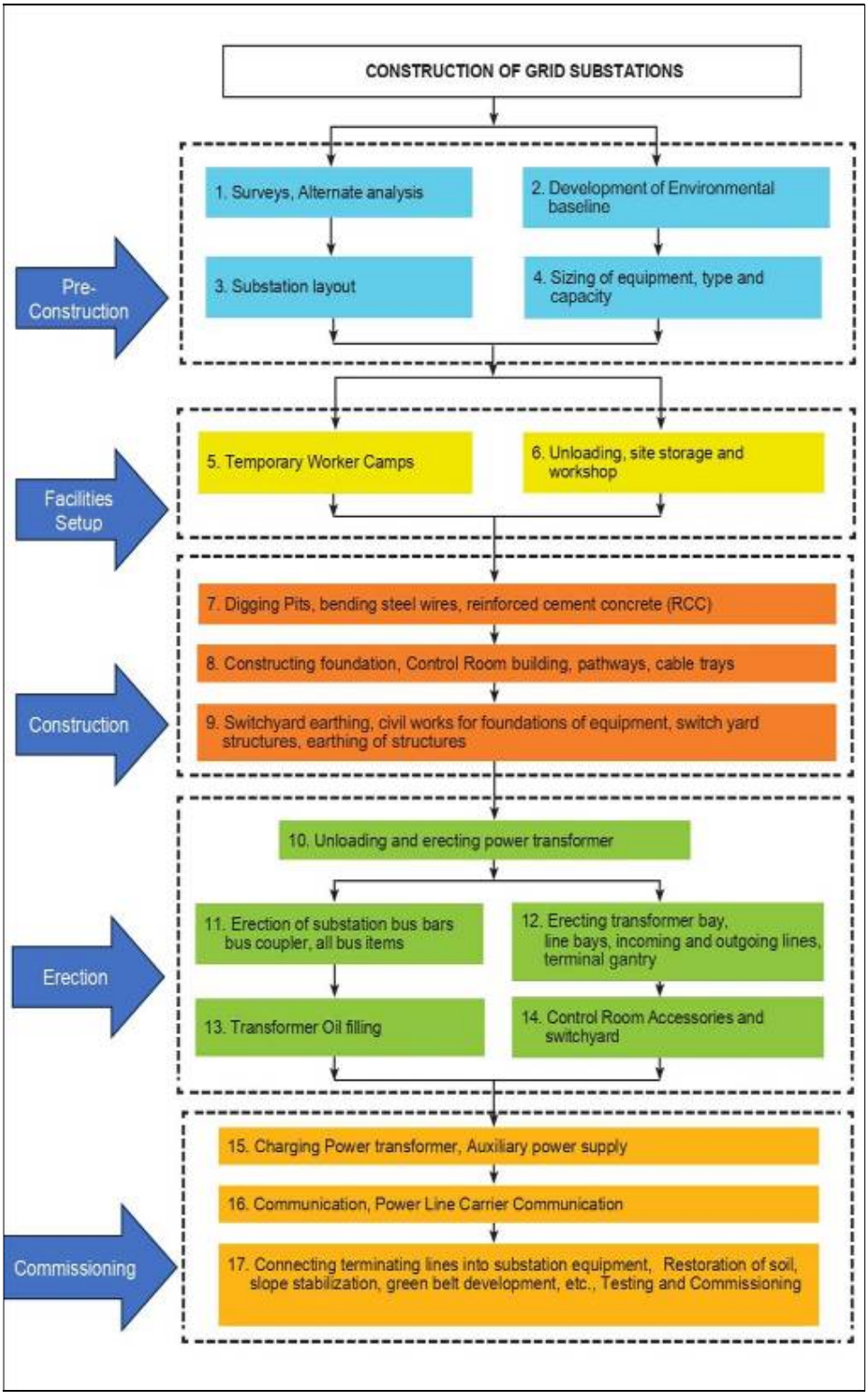


Figure 11: Stage wise construction activities of Grid Substations

Table 30: Environmental and Social Impact Significance Matrix for Grid Substations

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
Pre-Construction						
1	Survey, Alternate analysis	Enumeration of trees for cutting, identification of locations for digging of soil for foundations for equipment, buildings etc., stacking area for construction material etc. Identification of land. (effort will be taken to avoid involuntary acquisition of land)	Substation land	Potential impact on physical resources - Topography, possible loss of biodiversity in the area, interference with private land & structure, common property resources, public utilities such as roads, water, sewage facilities etc.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
2	Development of Environmental Baseline	Collection of soil samples by using digging machines as well as collection of water from wells/water sources.	Substation Land	Minor impact of collection of soil samples using digging machines on topography or pollution of water source during sample collection. Marshy areas, low-lying areas, riverbeds, earth slip zones that would involve risk to stability of the foundations.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Major	Moderate
3	Substation Layout	Development of benches by cutting and filling inside the substation sites to ensure proper placement of all equipment.	Substation site	Planned cutting and filling will lead to soil erosion, runoff of soil, potential water logging, suitable places to dispose excess soil, cutting of trees on the site.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Major	Moderate
4	Sizing of Equipment, Type and Capacity	Type of equipment installations/foundations planned as per electrical layout plan	Substation land	Potential digging for foundations and surface runoff of soils and any leaching of oils to ground water	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Major	Moderate
Facilities Set-up						

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
5	Temporary Worker Camps	Scatter of kitchen waste, toilet waste, wastewater, scrap, unusable/ nonrecyclable waste in camps. Poaching of animal life, fishing, harvesting of wood by workers	Worker Camp	Oils, untreated wastewater, sewage etc. flowing into water body, river, drainage areas from the camps causing impact to surface water, ground water, any aquatic life downstream in the area. The downstream water in river can be polluted making it unfit for bathing or potable water. The camps can also adversely impact on ecological resources through poaching of wildlife and using wood from trees as firewood in the area.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
6	Procurement of construction materials from Borrow areas and quarries. Transportation and unloading of material at site, storage and workshop	Borrow area and quarry operation. Transportation of Construction materials. Levelling of storage place and cutting of trees to establish workshop, stores and designated maintenance areas. Stores having storage of oils, and chemicals; the workshop for steel cutting welding etc. Transportation of equipment to sites using heavy cranes to unload equipment.	Borrow areas and quarry sites. Construction site, Stores, machine shops	Land Degradation and impact on terrestrial ecology – tree cutting, disposal of scrap, unusable/non-recyclable waste. Nuisance to the people by the way of noise vibration and dust. Also, impact on air quality/noise levels due to vehicle emissions and water quality - toilet waste, oils, sewage, slurry from workshops flow into the ground or into surface water polluting the land and water body affecting aquatic life.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
Construction						
7	Digging Pits, Bending	Surface run-off of pre-stacked	Substation land	Ground and surface water quality,	*Magnitude of*	High

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
	steel wires, reinforced cement concrete (RCC)	soil, oil leakages from engine and vehicles. Steep contour, improper soil type encountered.		aquatic ecology may be affected due to surface soil run-off, dripping of oils from engines of digging machines. Steep contour, improper soil type encountered making the foundations very huge.	*Impact*: Major *Sensitivity of Receptors*: Major	
8	Constructing foundations, Control Room building, pathways, cable trays	Digging and concrete casting of foundations for structures, transformers, pillars/columns for buildings, trenches, cable trays, road, drainage etc.	Substation Control Room, and switch yard area	Solid waste generation at the substation site will include metal scraps, wooden packing material etc. Excess soil from foundations/ muck will be laid out in areas that may interfere with drainage of the area. Injury and sickness of workers and members of the public; Incidents/accidents; Gender Based Violence /Sexual Exploitation. Potential conflict between migrant workers and local inhabitants.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Major	Moderate
9	Switchyard earthing, Civil work for foundations of equipment, Switchyard structures, Earthing of structures	Digging and concrete casting of foundations for structures, earthing of equipment	Substation Control Room, and switch yard area	Solid waste generation at the substation site will include metal scraps, wooden packing material etc. Wastewater may also be generated at site. Excess soil from digging of structure foundations if laid out in areas may interfere with drainage of the area.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Major	Moderate
Erection						

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
10	Unloading and erecting Power Transformer	Transportation of transformer to the site on flatbed trailer, unloading and erection of the power transformer on the Transformer Bay	Road access	Improper road access and road bridges that can withstand the weight of the transformer to the site causing delay in transportation and unloading.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
11	Erection of substation bus bars, Bus Coupler all Bus items	Personal Protective Equipment (PPE's) not used by workers	Substation site	Unsafe erection of substation bus bars/tower can result in injuries to the workers. Untrained workers can lead to more accidents and fatalities	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
12	Erecting transformer bays, line bays, incoming and outgoing lines, terminal gantries	Location of terminating towers outside the substation and similarly for outgoing lines and terminal gantry. Erection of adjoin Bus bars and transformer bays	Tower bases	There will be numerous terminating gantries for incoming and outgoing lines near the switchyard boundary causing problems to local community and making their agricultural fields useless. In case of electric short/blowout, the adjoining bay transformer and equipment may get affected.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
13	Transformer Oil Filling, Storage of Battery water, battery bank etc.	Storage of equipment, transformers, oils, fuels, battery water, other chemicals, battery bank at the project site for erection and filling.	Transformer bay and battery room	Contamination of land and or nearby water bodies by transformer oil, fuels, chemicals, battery water etc. can occur during erection and operation due to leakage or accident.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
14	Control Room, Accessories and switchyard	Connectivity and internal wiring in Control room panels for bays. Storage of SF6 gas cylinders.	Substation switchyard	Short circuits, fire due to improper connectivity, overload or accident. Inapt storage of SF_6 gas cylinders, untracked leakage of SF_6 from equipment.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
Commissioning						
15	Charging Power	Erection, filling of oil and	Switchyard	Leakage of transformer oil and	*Magnitude of*	Minor

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
	Transformer, Auxiliary power supply	charging the power transformer		sparking due to loose connections from standby power set.	*Impact*: Moderate *Sensitivity of Receptors*: Moderate	
16	Communication, Power Line Carrier Communication	Connectivity and internal wiring in Control room panels for bays.	Location: Control Room, Switch yard	Remote operation of substation and line jeopardized due to faulty installation.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Moderate	Minor
17	Connecting terminating lines into substation equipment Restoration of soil, slope stabilization, green belt development, Testing and Commissioning	Connecting jumpers between the suspension clamps on incomer lines to the bus bar, and drop down to power transformer via isolators, CT, PT, CB etc. Connecting of cable spacers and other accessories on the power cable.	Substation	Improper connections, improper spacing and distance from nearby structures causing faults. Increase in soil runoff, soil erosion due to improper slopes, blockages in drains and slopes. Impact on terrestrial ecology and migratory birds.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High

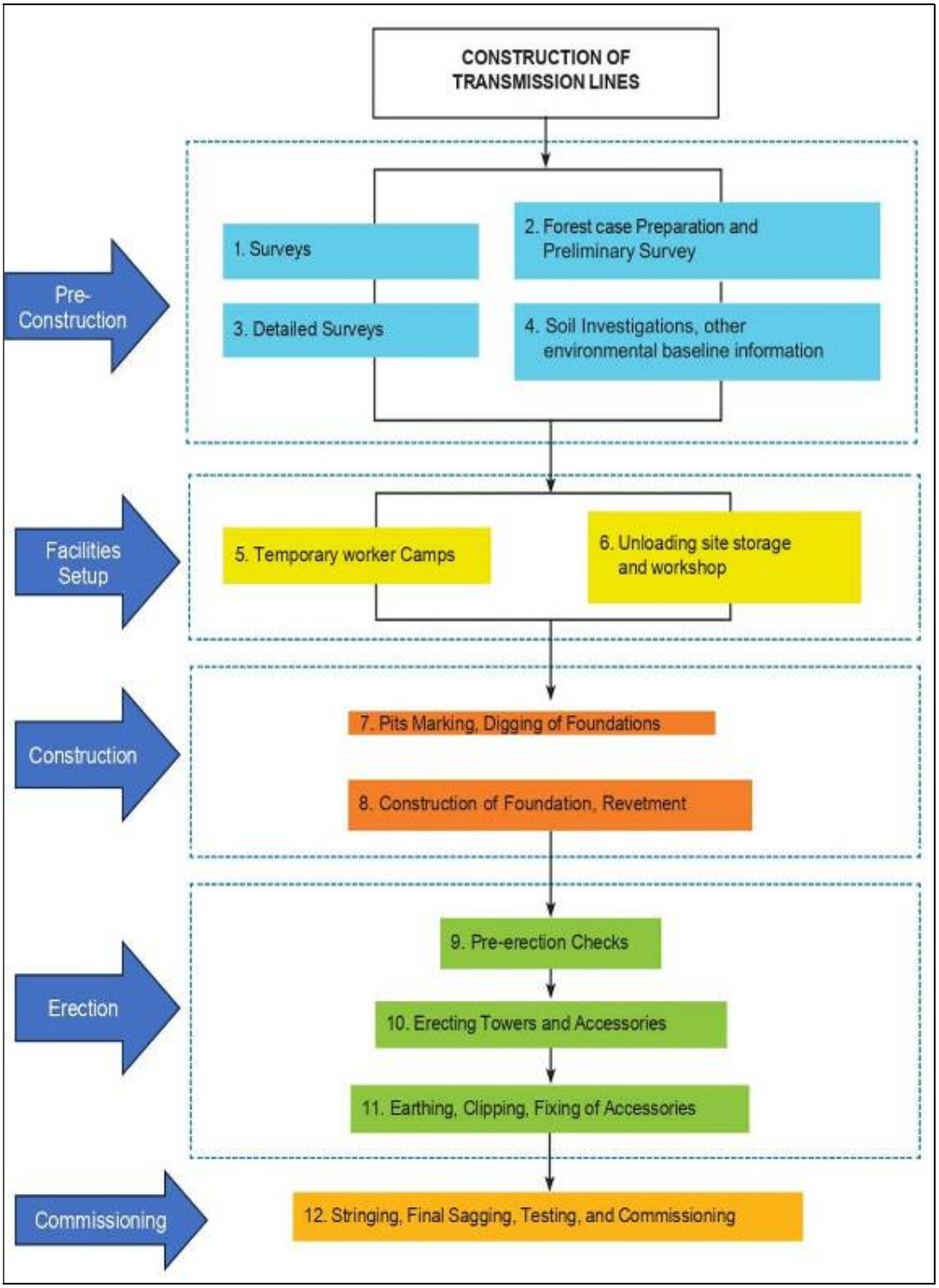


Figure 12: Stage wise construction activities of Transmission Lines

Table 31: Environmental and Social Impact Significance Matrix for Transmission Lines

Sr. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
Pre-Construction						
1	Route Survey	Enumeration of trees for cutting, identification of locations for digging of soil for tower base, development of quarrying sites, stacking area for construction material etc. Avoidance of public/private structure, public utilities, common property resources etc. as far as possible.	Tower Base and RoW of Transmission line	Potential impact on - private land, agriculture land & livelihood, other Physical resources-Topography, possible loss of biodiversity, interference with public utilities.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
2	Forest Case Preparation and Preliminary Survey	Marking of trees/vegetation for cutting at the tower base and for trimming inside the right of way, access roads etc.	Tower Base and RoW of Transmission line	Potential impact on physical resources, topography during construction and loss of tree cover which would lead to erosion, landslips and landslides in hilly areas causing topographical impacts creating gullies, ridges etc.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
3	Detailed Surveys	Land owner identification for transmission line corridor and towers located in agricultural fields, forest areas, portions of houses/ buildings falling in tower foundations.	Tower Base and RoW of Transmission line	Potential impact on - private land, agriculture land & livelihood, resettlement, other Physical resources-topography, possible loss of biodiversity, soil erosion, land slips/landslides in the area.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
4	Soil Investigation, other environmental baseline information	Collection of soil samples by digging manually/using machines as well as collection of water from wells/water sources nearby RoW	Tower Base	Minor impact of collection of soil samples on topography or pollution of water source during sample collection.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Moderate	Minor
Facilities Set-up						
5	Temporary Worker	Scatter of kitchen waste, toilet	Worker Camp	Oils, untreated wastewater, sewage etc.	*Magnitude of*	High

Sr. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
	Camps	waste, scrap, unusable/non-recyclable waste in the area. Solid waste disposal, liquid waste disposal in camps, spillage into river, streams. Poaching of animal life, fishing, harvesting of wood by workers.		flowing into water body, river, drainage areas from the camps causing impact to surface water, ground water, any aquatic life downstream. The downstream water in river can be polluted making it unfit for bathing or potable water. The camps can also adversely impact on ecological resources through poaching of wildlife and using wood from trees as firewood causing ecological damage in the area.	*Impact*: Major *Sensitivity of Receptors*: Major	
6	Transportation and unloading of material at site, storage and workshop	Levelling of soil for creation of storage place. Transportation of construction materials and equipment to sites using heavy cranes to unload/ load equipment (Storage areas, Tower Bases) Toilet waste, scrap, unusable/non-recyclable waste, oils, sewage, slurry from machines, dripping oils from trucks etc. Welding, cutting and fabrication of raw material etc.	Construction Sites, Workshops, stores, machine shops and access roads	Levelling of soil, vehicular emissions impacts air quality/noise levels in the area. Cutting of trees, soil erosion will impact terrestrial ecology of the area. Nuisance to the people by the way of noise vibration and dust. Workshop wastes impacts ecological resources due to unplanned solid waste, unsafe wastewater, other liquid waste disposal flowing into water bodies, drainage etc. affecting the ground water, aquatic ecology of water bodies in the area.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
Construction						
7	Pit Marking, digging	Clearing of land for tower in	Tower Foundation	Impact on physical resources, topography	*Magnitude of*	High

Sr. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
	of foundation	agricultural fields or hilly areas. Improper soil type encountered making the tower footing very huge and contour specific. Pile foundation in case of marshy lands, hilly and river basins may be required. Stacking of dug up soil, usage of digging machines for foundations.		during construction - loss of trees would lead to erosion, landslips and landslides in hilly areas creating gullies, ridges etc.) Ground and surface water quality, aquatic ecology may be affected due to surface soil run-off, dripping of oils from engines of digging machines. Impact on environmental resources- air quality/noise levels due to use of machinery for digging or stacking of loose soil. Loss of agricultural land would impact on human environment	*Impact*: Major *Sensitivity of Receptors*: Major	
8	Construction of Foundation, Revetment	Digging and concrete casting of foundations for Towers Surface run-off of pre-stacked soil, oil leakages from engine and vehicles. Steep contour, improper soil type encountered	Tower base	Ground and surface water quality, aquatic ecology may be affected due to surface soil run-off, dripping of oils from engines of digging machines. Steep contour, improper soil type encountered making the tower footing very huge and contour specific requiring revetment. Injury and sickness of workers and members of the public; Incidents/accidents; Gender Based Violence /Sexual Exploitation Potential conflict between migrant	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High

Sr. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
				workers and local inhabitants.		
Erection						
9	Pre-Erection Checks	Shifting of distribution lines, water supplies, cutting trees etc. under the planned right of way. Disbursement of compensation for tower base and T/L corridor as determined by revenue circle/ district administration.	Tower Base and RoW of Transmission line	Disturbances to local population due to temporary outages of power as distribution lines are disconnected Utilities such as water supply etc. may be disturbed because of the above.	*Magnitude of Impact*: Moderate *Sensitivity of Receptors*: Moderate	Minor
10	Erecting towers, arms, Erection, Tightening and Punching	Personal Protective Equipment (PPE's) not used by workers and not available to nearby residents. Adequate distances not maintained from neighbouring properties and structures. Loose soil left unattended after completion of erection of tower.	Tower	Unsafe erection of tower can result in injuries to the workers and residents in the area. Untrained workers can lead to more accidents and fatalities. Weather conditions in hilly areas could result in tower failure or topple partially or fully during erection and stringing due to uneven stringing loads, severe wind conditions.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
11	Earthing, clipping and fixing of accessories, installation of OPGW (Optical Ground Wire)	Installation of Earth wire and Accessories. Earthing the tower and the conductor.	Tower	Accident at tower site due to falling of accessory, snapping of earth- wire of incorrect tensioning etc. Impact on safety of workers due to lack of PPEs. Improper refilling of soil at earthing location may cause soil run-off.	*Magnitude of Impact*: Major *Sensitivity of Receptors*: Major	High
Commissioning						
12	Stringing and final sagging and tensioning of earth-	Stringing of cable onto the erected towers, accessories manually or using equipment.	Tower line	Snapping of stringing blocks, unbalance load during stringing on tower leading to collapse, falling cables injuring workers,	*Magnitude of Impact*: Major	High

Sr. No.	Project Activity	Tasks	Location	Potential Impacts	Magnitude & Sensitivity	Impact Significance
	wire and power conductor, Testing and Commissioning	Addition lopping of trees required within the ROW.		others etc. Stringing the wire loosely may result in cable touching the ground and other obstructions that could cause damage. Extensive lopping of branches etc. in hilly terrain may be required to maintain ROW as compared to lines running over level ground. Disturbance to avifauna species due to collision with transmission line, electrocution to wildlife including avifauna.	*Sensitivity of Receptors*: Major	

5.3 Impact Mitigation Strategy

The impact mitigation strategy adheres to a hierarchical approach, prioritizing avoidance, remediation, and compensation/offset measures. When evaluating potential substation sites, careful attention was given to the following parameters to minimize impacts to the greatest extent possible:

- Avoidance of settlement clusters or villages habitation site.
- Maintain a safe distance from villages and cultivable lands.
- Avoid inclusion of waterbodies, marshy land, etc. for selection of sites.
- Refrain from choosing ecological sensitive areas and ensure a distance from sensitive receptors such as schools and hospitals.
- Prioritize government wasteland for establishing substation sites; if unavoidable, adhere to compensation regulations for private owners as per applicable laws.

As per discussions with AEGCL authorities, while considering the transmission line routes, alternative route assessments shall be conducted considering the following parameters.

- Avoiding Forestland: The route selection shall consider the best option to avoid Forest Land / Protected Areas as far as possible
- Avoiding Habitation: The key considerations in selecting the corridor route included avoiding clustered settlements, common access routes and pathways, markets, community structures and private land to the extent possible
- Length / Crossings: The transmission route identified shall ensure the most feasible one after considering the environmental, ecological and social impacts of the same
- The alignment of the distribution line should be most economical from construction and maintenance point of view
- The number of angle points to be kept to a minimum
- The distance between the terminal points specified to be kept shortest possible and consistent with the terrain that it encounters
- Marshy and low-lying areas, riverbeds and earth slip zones to be avoided to minimize the risk to the foundations
- It would be preferable to utilize level ground for the alignment
- Crossing of power lines should be kept to minimum. Alignment shall be kept at an idealdistance from power lines to avoid induction problems on the lower voltage lines
- Proximity and parallelism with telecommunication lines shall be eliminated to avoid danger ofinduction between them
- Areas subject to flooding such as channels, drains, canals shall be avoided
- Restricted areas such as civil and military airfields shall be avoided including aircraft landing approaches
- All alignments should be easily approachable in dry and rainy seasons to enable maintenance throughout the year
- Effort shall be made to keep the route at a distance from mining areas

Following the assessment of impact magnitude, the subsequent step involves implementing remedial measures for the identified impacts. Design alterations are undertaken as necessary to address the impact effectively. In cases where remedial measures are unfeasible, compensatory mechanisms are employed to facilitate appropriate compensation for the incurred losses. The final step in the hierarchy prioritizes the prevention of impacts through heightened awareness programs and safety inspections, forming integral components of the overall mitigation strategy.

5.4 Environmental and Social Impacts and Mitigation Measures

This section provides a detailed exploration of the potential risk and impacts of the project activities on physical, biological environment and socio-economic environment of the project area and describes the mitigation measures based on the principles of avoidance, minimization & mitigation, including offsetting/compensating any residual issues to meet the requirement of sustainable development and compliance of AIIB's ESSs. This addition seeks to enhance the overall assessment framework by explicitly considering the broader impacts on the environment, the well-being of local communities, and the safety of both workers and the public throughout the project's lifecycle. By incorporating these vital dimensions, the 'Assam Intra State Transmission System Enhancement Project', Phase-II, endeavours to ensure a more thorough and well-rounded evaluation of its impact, fostering a sustainable and responsible approach to power transmission infrastructure development. The generic Environmental & Social Management Plan (ESMP) for the proposed substations and associated transmission lines are presented in **Table 32** and **Table 33** respectively**.**

5.4.1 Physical Environment

- **Positive Impacts**

  - **Reduction in Greenhouse Gas Emission**: The accessibility of power reduces the reliance on natural resources such as firewood and charcoal for daily necessities. This, in turn, contributes to the preservation and protection of forests and vegetation, directly leading to a reduction in greenhouse gas emissions. Residential emissions, standing as the second-largest contributor to ambient air pollution, play a significant role in this environmental conservation effort.

- **Adverse Impacts**

  - **Land Use Change (Habitat Alteration and Fragmentation)**: The construction of transmission lines and substation structures has the potential to alter the existing land use patterns. This project could impact areas designated for agriculture, forests, market zones, or densely populated settlements, leading to a change in their intended use. To mitigate these effects, careful consideration should be given to the selection of the transmission line route alignment. Whenever feasible, the line alignments should traverse through barren land or utilize the Right of Way (RoW) of existing roads without disrupting traffic flow. To minimize adverse impacts, the following mitigation measures will be implemented:

    Mitigation Measures:
    - Selecting line route which required least land acquisition.
    - Avoiding forest and wet land wherever possible.
    - To the extent of possible, barren land will be selected for line route and for construction of substation.
    - Wherever possible, the proposed line will be aligned along the existing RoW of road without hampering traffic movement.

  - **Soil Pollution**: Soil pollution, as explored in this context, results from various factors such as soil erosion, landslides, the temporary stockpiling of construction materials on land, and improper waste and spoil disposal. The excavation activities involved in foundation works can disrupt the natural condition of soil and rock in limited areas. The digging for poles and substation foundations may contribute to soil erosion and siltation problems in the

surrounding areas. Additionally, the clearance of forested areas can lead to erosion and siltation, contaminating nearby water bodies. Haphazard storage of construction materials, such as sand and gravel on fertile land, further diminishes the fertility of the soil, exacerbating the issue of soil pollution.

Mitigation Measures:
As part of mitigation, construction materials to be stored within the footprint of the site to avoid any kind of damage or contamination of soil/crop of adjoining areas. Movement of material and manpower shall be restricted to existing roads/tracks or as agreed upon with the stakeholders to avoid creation of new roads/tracks.

- **Loss of soil stability and soil erosion:** The construction of transmission lines and substations involves excavation work. In hilly slope areas, building transmission lines may lead to slope destabilization, potentially causing landslides as rainwater permeates through the loosened excavated earth. Moreover, the soil becomes more susceptible to erosion from rainfall and wind after excavation activities.

  Mitigation Measures
  - The tower location identified for transmission line should be stable and in flat ground if possible.
  - Proper geological study shall be conducted to determine the ground conditions if necessary.
  - The excavation shall not be done during rainy season in hilly slope.
  - Construction of line may over-burden the slope land and may trigger the slide. Therefore, soil bearing capacity and strength of slope land shall be checked before construction of transmission lines and substations.

  Similarly, improper dumping of debris will cause soil erosion in rainy season and impacts lower land in hill area, agriculture land and increase sediment flow in river.

  - The debris generated from excavation will be removed from the site immediately or will be reused at the site. If possible, the debris shall be used for backfilling which reduce the need of dumping site.
  - The debris will not be left at the site under any circumstances. Proper spoil dumping site will be located before start of the project.

- **Losses of Standing Crops**: The establishment of substations and the installation of transmission lines may disrupt agricultural productivity by reducing available arable land. This poses a significant challenge to farmers, impacting their income. Conducting construction activities during cultivation periods can lead to crop damage, further exacerbating the economic difficulties faced by farmers.

  Mitigation Measures:
  - Stringing of the line and other construction activities will be done in off-farming season.
  - The proposed line will be aligned along the existing RoW of road and edges of the fields.
  - The affected farmers shall be suitably compensated of standing crops and fruits on the basis district agriculture rate valuation by district agriculture office.

- **Impact due to waste disposal**: Improper disposal of construction waste poses significant

environmental and public health risks. Construction debris, primarily composed of non-biodegradable solid waste, can degrade soil quality and hinder agricultural productivity when haphazardly discarded. Additionally, the negligent disposal of transmission wires, fittings, and metals in public areas can result in injuries to local residents. The potential harm extends beyond physical injuries, as these materials can cause water pollution and other nuisances when not managed properly. Furthermore, the solid waste generated from camp sites, being mainly decomposable, demands careful disposal to prevent water pollution and related environmental issues. It is imperative for construction activities to adopt responsible waste management practices to mitigate the adverse effects on both the environment and the well-being of local communities.

Mitigation Measures:

- Disposal sites will be chosen in consultation with the local community, ensuring a minimum distance of 1 km from settlements, schools, hospitals, religious and cultural sites, as well as other environmentally sensitive areas, including water sources.
- The Contractor is encouraged to utilize spoils/wastes for construction purposes whenever feasible.
- Adequate drainage facilities must be implemented around spoil disposal sites to prevent environmental impact.
- Waste generated from the campsite will be meticulously managed, with strict prohibition against disposal in rivers and open grounds. Continuous monitoring will be enforced.
- Camp sites will be equipped with pit toilet facilities, and open defecation will not be permitted.
- Organic solid waste from the campsite will undergo decomposition either in compost bins or through the construction of a pit ground, covered by a sufficient layer of soil.
- The Contractor is responsible for managing undecomposed solid waste, ensuring it does not infiltrate water sources, forest land, agricultural areas, etc.

- **Air and Water Pollution**: Excavation for foundation works and breaking activities are potential sources of dust particle emissions. Additionally, the movement of vehicles engaged in hauling materials and supervision activities may contribute to the deterioration of air quality within the project area. Majority of the transmission line and substation area is accessible via rural roads, and equipment usage is minimal, the anticipated impact on air quality is considered to be negligible.

  Water sourced from nearby rivers and rivulets will be utilized for various construction activities. Improper disposal of debris, solid wastes including cement slurry, other construction materials, and human waste from the campsite has the potential to adversely impact the quality of river water. The prevalent practice of disposing organic materials and cleaning equipment in water bodies poses a significant risk of water resource pollution.

  Mitigation Measures:

  - All vehicles used for transporting construction materials and spoil will undergo thorough inspections to ensure compliance with government laws and proper operating conditions.
  - Tarpaulin covers will be utilized to shield construction materials and spoil during transportation.
  - To prevent rainwater and dust emissions at stockpiling sites, construction materials will be securely covered with tarpaulin, surrounded by side barriers to minimize the

risk of mixing with deleterious materials.
- Dust emissions at the work site will be effectively managed through regular water sprinkling.
- The solid waste generated by workforce shall be disposed-safely away from water resources.
- Onsite sanitation facility will be provided at the camp site.
- Good construction practices and site management will be adopted to avoid impacting soil and ground water, and pollution of water bodies from accidental spills from fuels and lubricants etc.
- The construction equipment and vehicles shall not be allowed to wash and clean in the water bodies near site. Maintenance and cleaning will be carried out in garage.

- **Noise and Vibration Pollution**: Construction activities at substations and transmission towers can potentially disturb nearby sensitive receptors due to noise generated by various tasks such as foundation work, tower erection, and conductor stringing. To minimize impact, construction should be organized sequentially, concentrating on specific areas to reduce the overall duration of noise disturbance. For instance, tower erection and stringing may take 3 to 6 months, but actual construction only occurs for about 15-30 days, with minimal lag time between foundation laying and tower erection. Additionally, substation construction, particularly the control room phase, may result in increased dust emission compared to other activities.

  Mitigation Measures:
  - The vehicle being used for transportation of construction material and spoil shall be regularly checked and kept in good condition. Vehicles producing high sound will not be allowed to move on the road and near working site.
  - Drilling equipment with low sound emission shell be used and if possible, sound trapping machine like silencer will be attached.
  - The drilling and excavation work will be carried out during daytime and not allowed in night-time.

5.4.2 Ecological and Biological Environment

Ecological and Biological Impacts of the Transmission lines

It is expected to that there will not be any significant irreversible change in the local biodiversity as a result of the project. Any disturbance to the wildlife will be temporary (which is only for the construction phase), and the faunal movement might be diverted for the time being, which will be nullified after few years of operational phase.

Impacts on Terrestrial Biodiversity

Transmission lines crossing into sensitive ecological areas

As per survey reports and selection of sites for substations, necessary precautions have been taken to avoid routing of line through forest and Protected Areas (National Parks/Sanctuaries/Reserve Forests/Wetlands). A segment measuring 6.36 kilometers of the '132 kV Shakardevnagar (Existing) S/C Line – Lumding (New) S/C Line' (Approx. 10 KM) route traverses Lumding Reserve Forest and LungtingMupa Reserve Forest.

- Mobilization of Construction Equipment and Materials: The construction of the Transmission Line (TL) within Sanctuary area require movement of construction materials and tower parts. For transportation at the site where there are no existing paths/roads for movement of vehicles, head loading shall be done eliminating the need of any vehicle. Thus, the impacts of mobilization of construction equipment are marginal since large numbers of heavy vehicles and machines shall not be deployed.
- Influx of Project Staff and Contract workers: It is estimated that each gang comprising of small size groups (<20) of workers will be hired/deputed during the pre-construction and construction stage. This include contractors and their regular staff plus migrant workers. It must be ensured that that no activity is carried out after sunset within the sanctuary area.
- Loss of forest cover and habitat for wildlife: There will be little impact due to TL as there is not much of forest cover and food/prey for wildlife. For 132 kV transmission line maximum width of RoW is 35 m. The total area of transmission line passing through the wildlife sanctuary is 22.3 ha (6.36 Km X 35 m).

Mitigation Measures:

- Minimizing Right of Way (RoW) Requirement: Efforts will be made to reduce the width of the area cleared for the transmission line, thereby minimizing habitat disruption and preserving more vegetation.
- Maintaining Necessary Ground Clearance: Ensuring sufficient ground clearance to prevent electrical hazards while allowing for wildlife movement underneath the lines without obstruction.
- Utilizing Existing Towers: Where possible, existing towers will be used to avoid additional land clearing and construction impacts.
- Employing Tall or Extended Towers: Using taller towers can reduce the need for extensive vegetation clearing and help maintain the integrity of forest canopies, which are crucial for many species.
- Opting for Underground Cabling in Protected Areas In environmentally sensitive and protected areas, underground cabling will be used to avoid surface-level habitat disruption and visual impact.
- Obtaining Requisite Forest Clearances and Approvals: Prior to any work in forested areas, AEGCL will secure all necessary clearances and approvals from the Ministry of Environment, Forest and Climate Change (MoEF&CC) and the Department of Environment and Forest, Government of Assam (GoA).
- Periodic Permissions for Tree Pruning: During the project's operational stage, AEGCL will seek permissions from concerned forest divisions for tree pruning to maintain safe clearance distances from transmission lines, minimizing long-term vegetation loss.

Vegetation Loss and Right-of-Way Maintenance

While regular vegetation maintenance is essential for preventing power outages and disruptions, the use of mechanical methods, such as mowing or pruning machinery, can introduce challenges. These methods have the potential to disrupt wildlife and their habitats, necessitating a careful balance between maintenance needs and environmental impacts.

Mitigation Measures:

- Implementation of Integrated Vegetation Management for Selective Tree Removal: Employing a targeted approach to vegetation management involves selectively removing trees and plants that pose a risk to the transmission lines while preserving as much natural habitat as possible. This method minimizes the impact on the ecosystem by focusing only on the vegetation that directly interferes with power lines.

- Removal of Invasive Plant Species and Cultivating Native Plant Species: Whenever possible, maintenance activities will prioritize the removal of invasive plant species, which can disrupt local ecosystems. In their place, native plant species will be cultivated to restore and maintain biodiversity. Native plants support local wildlife and help maintain ecological balance.
- Scheduling Activities to Avoid Breeding and Nesting Seasons for Critically Endangered or Endangered Wildlife Species: Maintenance activities, especially those involving significant disturbance, will be scheduled to avoid the breeding and nesting seasons of critically endangered or endangered wildlife species. This scheduling helps protect vulnerable populations during critical periods of their life cycle, reducing the risk of harming wildlife.
- Compensatory Afforestation: The loss of trees will be addressed according to the current guidelines issued by MoEF&CC, Govt. of India, with compensatory afforestation scheme over degraded forest land on twice area of forest land proposed for diversion. The project proponent shall provide funds for the compensatory afforestation as per the guidelines of MoEF&CC.

Forest Fires

Unchecked growth and accumulation of slash within right-of-way boundaries may lead to forest fires, posing significant risks to both the natural environment and the integrity of the power transmission infrastructure. The potential for fires is heightened if underlying growth is left unmanaged or if routine maintenance slash is allowed to accumulate.

Mitigation Measures:

- Monitoring Right-of-Way Vegetation for Fire Risk: Regular monitoring of vegetation within the right-of-way will be conducted to identify areas at risk of fire. This proactive approach helps in early detection and management of potential fire hazards.
- Timely Thinning, Slashing, and Maintenance to Mitigate Fire Risks: Implementing timely thinning and slashing of vegetation reduces the amount of combustible material that can fuel fires. Routine maintenance ensures that slash and other debris do not accumulate and pose a fire risk.
- Establishment of Fire-line: Creating a clear and maintained strip of land adjacent to the transmission infrastructure to act as a barrier against the spread of wildfires. This fire line serves as a protective measure to minimize the risk of vegetation-related fires impacting the transmission infrastructure, ensuring the safety and reliability of the power supply.
- Establishment of Fire-Resistant Species Within and Around Rights-of-Way: Planting fire-resistant species within and around the rights-of-way can create natural firebreaks. These species are less likely to ignite and spread fires, thereby protecting both the environment and the transmission infrastructure.

Avifauna Electrocution & Risk of Collision

Transmission towers pose collision and electrocution risks to birds and bats, potentially impacting biodiversity and ecological balance. The combination of tower height and the electricity carried by transmission lines increases the potential for fatal interactions, especially when located within critical flyways or migration corridors.

- Electrocution: Birds and bats may inadvertently come into contact with energized components of transmission infrastructure, resulting in electrocution. This can lead to fatalities among avian populations and disrupt local ecosystems, affecting biodiversity.

- Collision Risk: The presence of transmission towers within avian flyways or migration corridors increases the likelihood of birds colliding with the wires or structures. Collisions can cause injury or death to individual birds, impacting population dynamics and species diversity.

- Disturbance to Nesting Sites: Construction and maintenance activities associated with transmission lines can disturb nesting sites of birds, potentially causing abandonment or displacement of nesting pairs and their offspring.

Mitigation Measures:

- Alignment of Transmission Line Corridors Away from Critical Habitats: By avoiding critical habitats such as nesting sites and migration routes, transmission line corridors can be planned to minimize avifauna exposure to collision and electrocution risks. This proactive approach helps protect sensitive bird populations and preserves their habitats.
- Installation of Bird Deflectors: Bird deflectors installed along transmission lines create physical barriers that deter birds from contacting energized components. These devices redirect birds away from hazardous areas, reducing the likelihood of electrocution incidents and minimizing collision risks.
- Provision of Artificial Bird Safe Perches and Nesting Platforms: Offering artificial perches and nesting platforms away from energized parts of the infrastructure provides safe resting and nesting sites for birds. By encouraging avifauna to use designated safe areas, the risk of electrocution and collision can be mitigated effectively.
- Construction of Cross-Arms, Insulators, and Other Parts to Prevent Perching: Designing transmission line components to eliminate spaces where birds can perch near energized wires helps prevent accidental contact. This design feature reduces the likelihood of electrocution incidents and enhances overall avifauna safety.
- Ensuring Sufficient Insulation on Terminal Structures: Terminal structures such as transformers are equipped with adequate insulation on jumper wires and surge arrestors to prevent bird contact. This insulation reduces the risk of electrocution and ensures the safety of avifauna interacting with the transmission infrastructure.
- Implementation of Seasonal Work Restrictions: Restricting construction and maintenance activities during critical breeding and nesting seasons helps minimize disturbances to avian populations. By scheduling work outside of these periods, the risk of nest abandonment and disruption to breeding behaviors is reduced, promoting avifauna conservation.

Aquatic Habitat Alteration and Impact on Aquatic Life

The construction of power transmission lines, along with associated access roads and facilities, may necessitate the creation of corridors crossing aquatic habitats. The impact will be caused due to erosion of excavated spoil by rainwater and its subsequent deposition in the riverbed during tower foundation work. Furthermore, siltation problems are more significant, which may lead to disruptions in watercourses, wetlands, and riparian areas, impacting water quality and aquatic ecosystems.

- Erosion and Sedimentation: The excavation activities associated with tower foundation work can lead to soil erosion, resulting in the transport of sediments into nearby water bodies. Excessive sedimentation can disrupt aquatic habitats, affecting water quality, and potentially smothering aquatic organisms and their habitats.

- Habitat Disturbance: Construction activities and the creation of corridors across aquatic habitats may directly disturb riparian vegetation and aquatic ecosystems. This disturbance

can lead to habitat loss, fragmentation, and alterations in the ecological dynamics of the affected water bodies.

Mitigation Measures:

- Siting of Power Transmission Towers to Avoid Critical Aquatic Habitats: By carefully selecting transmission tower locations to avoid critical aquatic habitats such as spawning grounds, fish migration routes, and sensitive wetlands, the impact on aquatic life can be minimized.
- Minimizing Clearing and Disruption to Riparian Vegetation: Efforts will be made to minimize the clearing of riparian vegetation during construction activities. Preserving natural vegetation buffers along watercourses helps maintain habitat integrity and minimizes sedimentation runoff into aquatic ecosystems.
- Prohibition of Fishing Activities by Labor Force: To prevent additional stress on aquatic ecosystems, the labor force involved in construction activities will be prohibited from engaging in fishing activities in nearby water bodies. This measure aims to reduce disturbance to aquatic habitats and mitigate potential impacts on fish populations.
- Proper Management of Construction Spoil and Sediments: Measures will be implemented to manage construction spoil and sediments effectively. This includes constructing properly sized drains to control the flow of mud and spoil from the construction site, as well as promptly removing excavated spoil and depositing it at identified locations to prevent sedimentation in water bodies.

5.4.3 Socio-Economic Environment

➢ **Positive Impacts**

AEGCL envisages construction and system reinforcement of 132/220/400 kV substations and associated transmission lines and facilities will elevate the power sector within the state, fostering capacity building for sustained long-term development. AEGCL pledges to enhance access of electricity supply to rural areas and industrial areas, which shall directly contribute to increased socio-economic wellbeing with improved access to different types of services and facilities. It ultimately aims to reduce poverty with and uplift the existing level of livelihood accompanied by increased income, employment and access to digital services.

- **Employment Opportunities:** The implementation of the project will significantly benefit local communities by creating job opportunities. Both skilled and unskilled labour will be employed during construction, with a focus on prioritizing locals for employment. This initiative aims to boost income levels, improve living standards, and can be monitored through compliance measures, including tracking the involvement of local individuals in the project and the establishment of new industries.

- **Enhancement of local skills**: The project's development involves advanced equipment and technical expertise, which will be executed in the project area. Local individuals, based on their qualifications and skills, will actively participate in construction, gaining valuable technical knowledge. This knowledge transfer aims to stimulate a continuous pursuit of technical expertise, contributing to an overall increase in the knowledge quotient. Beyond enhancing local skills, this experience enables individuals to participate in similar projects across India.

- **Utilization of local commodities**: Construction activities in the project area boost local disposable income, leading to increased consumption of local goods. Additionally, various

construction materials such as aggregate, sand, cement, and steel will be sourced from nearby market centres, supporting the local economy.

- **Increase in trade and infrastructure**: Electrification will spur economic growth by facilitating the establishment of business centres, new industries, hotels, and shops. Access to electricity will elevate income, enhance production, and increase spending capacity, contributing to overall business expansion.

- **Enhancement of Education and Health Sector**: Limited access to electricity in rural areas adversely affects education and healthcare infrastructure. The absence of proper power supply hampers the operation of essential equipment in schools and healthcare facilities. Consequently, students lack awareness of crucial technological advancements. Similarly, the healthcare sector in rural areas faces challenges due to the unavailability of advanced medical equipment like X-ray machines, sonograms, and MRI machines, leading to potential fatalities. The lack of access to electricity is a significant barrier to the implementation of vital technologies in these essential sectors.

➢ **Adverse Impacts**

- **Land Acquisition and Involuntary Resettlement:** While permanent acquisition is not anticipated for transmission lines, private lands may be acquired for constructing substations, potentially affecting the livelihoods of cultivators, agricultural workers as well as land property. The land for towers and right-of-way (RoW) is typically not acquired permanently, allowing agricultural activities to continue after the construction phase but Installation of transmission towers might impact property prices. Additionally, the movement of machinery during the foundation, erection of towers, and stringing of transmission lines can lead to damage to standing crops, negatively impacting the livelihoods of cultivators.

  Mitigation Measures:
  AEGCL takes preventive measures during identifying sub-station location and line routing to avoid impact on rural and urban settlements. Construction of new substation if require acquisition of private land compensation shall be made as per the Land Acquisition Act 2013 (RFCTLARR, 2013). However, no permanent land acquisition is involved for tower foundation. While no resettlement is anticipated in the proposed sub-projects, temporary damages will be compensated according to the law. Transmission lines are planned to traverse agricultural lands and tea estates. AEGCL follows Avoidance, Minimization, and Mitigation principles, adjusting construction in crop areas to allow harvesting. Compensation is provided at market rates for standing crops if construction is unavoidable during the crop season. Efforts are made to minimize crop damage, with construction scheduled during lean periods. After construction, farming activity is allowed as per norms, and compensation is provided for any loss incurred by Affected Persons prior to foundation work, tower erection, and stringing.

- **Historical/cultural monuments/value or Temporary loss of access to common property resources:** During construction phase of transmission lines, there may be temporary and limited access to common property resources (CPRs) for the local community. These CPR lands serve various purposes for the community, including religious services, celebrations, holiday observances, grazing for cattle, and biomass sourcing for cooking fuel. The acquisition of these lands for substation construction leads to the loss of common cultural and natural resources, impacting the socio-economic condition of the local community. The temporary effects on CPRs are associated with the utility shifting during the construction phase.

Mitigation Measures:

The route selection criteria ensure the finalization of an alignment that steers clear of historical and cultural monuments. The initial assessment for transmission line route finalization indicates the absence of such monuments in the proposed alignments. Additionally, thorough care will be exercised during the detailed survey to avoid these structures and any impacts related to utility shifting or disturbance to access routes for CPRs.

- **Chance Find of Archaeological and Cultural Property and Procedures:** Any fossils, coins, valuable antiquities, structures, or other archaeological finds unearthed on the site will be owned by the Government and handled in accordance with relevant legislation. Without predefined procedures, the risk of damage to these archaeological remains is increased.

- ***Mitigation Measures:***

  The Contractor must take reasonable precautions to prevent workers or others from removing or damaging any discovered articles. Upon finding such items, the Contractor will immediately inform the Environmental Specialist – PMU/PMC and follow their instructions, suspending all work until further guidance is received. The PMU/PMC will consult the Archaeological Survey of India (ASI) before authorizing the Contractor to resume work on the site. Archaeological structures along the route must be protected, preserved, or enhanced in accordance with the law.

  In case of discovering treasures or archaeological artifacts during excavation, written notification will be sent to the District Collector or Commissioner/Archaeology department as per the provisions of Section-4 of the "Indian Treasure Trove Act, 1878 as amended in 1949." Construction activities will be temporarily suspended during this process.

- **Visual aesthetics:** The construction of transmission towers and lines has the potential to alter the visual appeal of the surrounding area. Concerns regarding impairment or impact on visual aesthetics due to the project were not raised in any of the consultations.

  Mitigation Measures:

  The project authorities will refrain from suggesting transmission line routes and substations in proximity to tourist spots or any areas of cultural and social significance.

5.4.4 Occupational Health and Safety Environment

- **Live Power Lines:** Workers are exposed to serious occupational hazards, including the risk of electrical shocks and injuries, when in contact with live power lines during construction and maintenance. This exposure is intensified due to the high voltage associated with power distribution lines.

  Mitigation Measures:

  - Restrict work on live power lines to trained and certified personnel.
  - Implement a thorough deactivation and grounding process before any maintenance work.
  - Enforce strict adherence to safety and insulation standards, ensuring workers are equipped with the necessary protective gear.

- **Working at Height**: Working at elevation on poles and structures poses significant risks, such as falls and injuries. The structural complexity and height amplify the potential severity of accidents.

  Mitigation Measures:
  - Prioritize the testing of structure integrity before commencing any work at height.
  - Establish and implement a comprehensive fall protection program, including proper training and equipment maintenance.
  - Define strict criteria for the use of fall protection systems, especially when working several meters above ground level.

- **Exposure to Chemicals:** Occupational exposure to chemicals is a reality, particularly in handling pesticides for right-of-way maintenance and dealing with PCB in transformers. This exposure includes risks of dermal contact and inhalation.

  Mitigation Measures:
  - Implement rigorous training programs for personnel involved in pesticide application, ensuring they are certified and well-informed.
  - Adhere strictly to post-treatment intervals to prevent worker exposure during reentry.
  - Enforce hygiene practices to minimize the risk of exposure to pesticide residues.

5.4.5 Community Health and Safety Environment

- **Electric and Magnetic Fields (EMF):** Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Electric fields are produced by voltage and increase in strength as the voltage increases. Magnetic fields result from the flow of electric current and increase in strength as the current increases. Both electric and magnetic fields decrease rapidly with distance. Power frequency EMF typically has a frequency of 50 Hertz (Hz) and is considered Extremely Low Frequency (ELF).

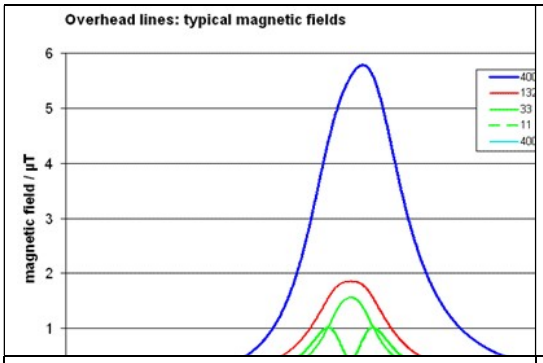


Figure 13:EMF Cross Section for Typical Magnetic & Electric Fields of transmission lines

Figure 14: EMF Exposure Limits of ICNIRP

Although there is public and scientific concern over the potential health effects associated with exposure to EMF there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still enough to warrant limited concern. World Health Organization (2007) recommends using exposure guidelines

published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP (2010) has set the limits at 50 HZ for the public exposure as: (1) electric field strength (kV per meter) is 5 kV/m, and (2) magnetic field strength (micro tesla) is 200 µT (equivalent to 160 A/m); while for the occupational exposure as: (1) electric field strength is 10 kV/m and (2) magnetic field strength is 1000 µT.

Mitigation Measures:

- Evaluation of public exposure against established reference levels.
- Site facilities to minimize public exposure.
- Consider engineering techniques to reduce EMF.

- **Electrocution:** High-voltage electricity poses a severe risk of electrocution, both directly and indirectly, for individuals coming into contact with power lines or associated equipment.

  Mitigation Measures:

  - Implement visible signs, barriers, and public education to prevent contact with dangerous equipment.
  - Ground conducting objects near power lines to minimize the risk of electric shock.

- **Visual Amenity**: Power projects, while essential, may be visually intrusive and impact the aesthetic appeal of local communities.

  Mitigation Measures:

  - Conduct extensive public consultation during the planning phase to consider community preferences.
  - Assess changes in property values due to power line proximity.
  - Optimize power line and substation locations with due consideration to landscape views and community features.
  - Explore burying transmission lines in densely populated or aesthetically sensitive areas.

- **Noise and Ozone:** Noise, such as buzzing or humming, and the production of ozone around transformers and high voltage power lines may cause concerns, especially during adverse weather conditions.

  Mitigation Measures:

  - Address noise concerns during project planning by locating rights-of-way away from human receptors.
  - Consider the use of noise barriers or noise-canceling acoustic devices when necessary.

- **Influx of labour:** During the construction phase, skilled labor for civil, mechanical, and electrical works will mainly comprise migrant workers, posing potential challenges in the nearby community. The temporary labor camp within the project boundary may strain local resources and lead to conflicts based on cultural and behavioral differences, as well as security concerns for local women.

  Mitigation Measures:

- Conduct community awareness programs, cultural sensitivity training, prioritizing local employment for unskilled positions, implementing health and sanitation protocols, and ensuring strict security measures.
- Dedicated measures to be included in workers' camp management to avoid potential Gender Based Violence /Sexual Exploitation.

5.5 Environmental and Social Management Plan

At the onset of this assessment, detailed ESMPs considering the worst-case scenario has been developed incorporating public consultation findings, which will serve as a contractual obligation. The ESMPs for the project identifies feasible and cost-effective measures to be taken to reduce potential significant, adverse, impacts to acceptable levels. Here, proper mitigation measures are proposed for each potential impact, including details on responsible parties for implementation of mitigation measures and supervision.

The EPC Contractor shall be mainly responsible for carrying out the work in full compliance with this ESMPs and applicable National, State, AIIB Policies governing E&S impacts throughout the project life cycle. In tandem with the Environmental and Social Management Plan (ESMP), the systematic and timely monitoring of real-time environmental and social data is indispensable for a comprehensive understanding of a project's impact and the effectiveness of mitigation measures. This additional plan is designed to facilitate the timely collection and analysis of pertinent data, ensuring that the implementation of the ESMP remains responsive and adaptive throughout the project's entire lifecycle proposed ESMPs for Substation and Transmission line and Real-Time Environmental and Social Data Collection and Assessment Plan is provided in **Table 32**.

Table 32: Environmental and Social Management Plan for Substations

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
Pre-Construction[18]								
1.	Survey, Alternate analysis	Enumeration of trees for cutting, identification of locations for digging of soil for foundations for equipment, buildings etc., stacking area for construction material etc. Identification of land. (Effort will be taken to avoid involuntary acquisition of land)	Substation land	Potential impact on physical resources - Topography, possible loss of biodiversity in the area, interference with private land & structure, common property resources, public utilities such as roads, water, sewage facilities etc.	Avoidance of biodiversity rich areas such as location near water body, forest etc. Consider better choice of location to avoid issues regarding, acquisition of private land, common resources with community and public utilities. If involuntary land acquisition is unavoidable, the acquisition process has to be initiated as per the Land Acquisition act 2013 and proper compensation / livelihood assistance has to be provided to the PAPs.	Surveyor / PMU / PIU /Contractor	PMC, PIU & PMU (AEGCL)	Once during substation siting survey and design
2.	Development of Environmental & Social	Collection of soil samples by using digging machines as well as	Substation Land	Minor impact of collection of soil samples using	Development of baseline with no project situation is a must for	Surveyor/Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during soil

[18] *All clearances/permits will be obtained prior to construction commencement*

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	Baseline	collection of water from wells/water sources.		digging machines on topography or pollution of water source during sample collection. Marshy areas, low-lying areas, riverbeds, earth slip zones that would involve risk to stability of the foundations.	monitoring impact of project construction activities. Marshy areas should be avoided. Care taken to ensure proper profiling of the ground rock formation and ground water.			sampling and water collection
3.	Substation Layout & Design	Development of benches by cutting and filling inside the substation sites to ensure proper placement of all equipment. Benching allows voltage level separation by physically collocating similar equipment in one bench.	Substation site	Planned cutting and filling will lead to soil erosion, runoff of soil, potential water logging, suitable places to dispose excess soil, cutting of trees on the site.	Water logged /steep sloped/ degraded sites must be avoided while selecting the location of substation. The layout of the site must be such that cutting of trees, soil is minimized. Extreme slopes need to stabilized for avoiding soil runoff	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the layout and design phase
4.	Sizing of Equipment, Type and Capacity	Type of equipment installations/foundations planned as per electrical layout plan	Substation land	Potential digging for foundations and surface runoff of soils and any leaching of oils to ground water	Plan for proper location analysis to ensure appropriate distances, installations of equipment, proper access roads etc.	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the planning and execution phases
Facilities Set-up								

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
5.	Temporary Worker Camps	Scatter of kitchen waste, toilet waste, wastewater, scrap, unusable/ nonrecyclable waste in camps. Poaching of animal life, fishing, harvesting of wood by workers	Worker Camp	Oils, untreated wastewater, sewage etc. flowing into water body, river, drainage areas from the camps causing impact to surface water, ground water, any aquatic life downstream in the area. The downstream water in river can be polluted making it unfit for bathing or potable water. The camps can also adversely impact on ecological resources through poaching of wildlife and using wood from trees as firewood in the area.	Contract provisions must specify minimum setback requirements for construction camps from water bodies, reserved areas etc. EPC contractor to provide liquefied petroleum gas cylinders for cooking, safe drinking water, washing and toilet facilities and sanitary soak-pits, medical facilities at the construction site for the workers. A detailed site Labour-Camp Management Plan will be prepared and followed including provision for separate camp, toilet for female labour.	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring, at least bi-weekly, during the construction phase.
6.	Procurement of construction materials from Borrow areas and quarries. Transportation and unloading	Borrow area and quarry operation. Transportation of Construction materials. Levelling of storage place and cutting of	Borrow areas and quarry sites. Construction site, Stores, machine shops	Land Degradation and impact on terrestrial ecology – tree cutting, disposal of scrap, unusable/non-recyclable waste.	Preparation and implementation of Borrow Area Management Plan. Selection of locations for material storage yards and workshops	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during material handling activities

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	of material at site, storage and workshop	trees to establish workshop, stores and designated maintenance areas. Stores having storage of oils, and chemicals; the workshop for steel cutting welding etc. Transportation of equipment to sites using heavy cranes to unload equipment.		Nuisance to the people by the way of noise vibration and dust. Also, impact on air quality/noise levels due to vehicle emissions and water quality - toilet waste, oils, sewage, slurry from workshops flow into the ground or into surface water polluting the land and water body affecting aquatic life.	away from the environmental sensitive areas. The vehicles used for unloading, transportation of equipment to site must comply with national pollution control standards. Drainage into water bodies to be avoided. Soak-pits for waste to be provided for toilets by the contractor. Preparation and implementation of Traffic Management Plan (TMP) by mapping sensitive locations such as educational and health care institutions, community structures, market areas etc.			
7.	Digging Pits, Bending steel wires, reinforced cement concrete (RCC)	Surface run-off of pre-stacked soil, oil leakages from engine and vehicles. Steep contour, improper	Substation land	Ground and surface water quality, aquatic ecology may be affected due to surface soil run-off, dripping of oils from	Restore the loose soil from foundations through ramming. Dispose of excess soil spread out in areas that do not interfere with	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during excavation and construction activities

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		soil type encountered.		engines of digging machines. Steep contour, improper soil type encountered making the foundations very huge	local drainage pattern.			
8.	Constructing foundations, Control Room building, pathways, cable trays	Digging and concrete casting of foundations for structures, transformers, pillars/columns for buildings, trenches, cable trays, road, drainage etc.	Substation Control Room, and switch yard area	Solid waste generation at the substation site will include metal scraps, wooden packing material etc. Excess soil from foundations/ muck will be laid out in areas that may interfere with drainage of the area.	Concrete waste, wooden waste and metal scrap will be collected and disposed to offsite in compliance with applicable regulations and rules. Contractor to manage waste generated from the construction sites without contamination to natural environment and it will reduce risk to public who stay close to sites. A Construction Waste Management Plan will be followed. Ensure proper drainage system is constructed.	Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during construction, with periodic assessments
				Injury and sickness of workers and members of the public;	An OHS Management plan will be prepared by OHS Expert of PMC and the same has to be	Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during construction,

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				Incidents/accidents; Gender Based Violence /Sexual Exploitation Potential conflict between migrant workers and local inhabitants.	implemented by the concern OHS officer of EPC Contractor. Also, OHS officer of EPC contractor should arrange occupational health and safety awareness programmes including AIDS and sexually transmitted diseases (STD). Potential conflict between migrant workers & local inhabitant to be addressed through workshops to workers regarding local customs, and codes of conduct. A Gender Action Plan is will be followed along with Constituting "Internal Compliant Committee" to handle potential Gender Based Violence /Sexual Exploitation			with periodic assessments
9.	Switchyard earthing, Civil work for	Digging and concrete casting of foundations for structures, earthing	Substation Control Room, and	Solid waste generation at the substation site will	Concrete waste, wooden waste and metal scrap will be	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	foundations of equipment, Switchyard structures, Earthing of structures	of equipment	switch yard area	include metal scraps, wooden packing material etc. Wastewater may also be generated at site. Excess soil from digging of structure foundations if laid out in areas may interfere with drainage of the area.	collected and disposed to offsite in compliance with applicable regulations and rules. Contractor to ensure no waste/ wastewater is collected at site that will contaminate the natural environment. Ensure proper drainage system is constructed.			construction
Erection								
10.	Unloading and erecting Power Transformer	Transportation of transformer to the site on flatbed trailer, unloading and erection of the power transformer on the Transformer Bay	Road access	Improper road access and road bridges that can withstand the weight of the transformer to the site causing delay in transportation and unloading.	Ensure bridges are tested for weight capacity and road widened enough in hilly areas so that the transformer could reach the site	Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during transportation and erection
11.	Erection of substation bus bars, Bus Coupler all Bus items	Personal Protective Equipment (PPE's) not used by workers	Substation site	Unsafe erection of tower can result in injuries to the workers. Untrained workers can lead to more accidents and fatalities	Construction manpower to use PPE at site at all times	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the erection phase
12.	Erecting transformer bays, line bays, incoming and outgoing lines,	Location of terminating towers outside the substation and similarly for outgoing lines and terminal gantry. Erection	Tower bases	There will be numerous terminating gantries for incoming and outgoing lines near	Proper survey of incoming and outgoing lines to a substation to ensure the adjoining agricultural land	Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during erection activities

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	terminal gantries	of adjoin Bus bars and transformer bays		the switchyard boundary causing problems to local community and making their agricultural fields useless. In case of electric short/blowout, the adjoining bay transformer and equipment may get affected.	required is minimized and the owner is compensated. Erection of firewall between two transformer bays to ensure protection from fire accidents.			
13.	Transformer Oil Filling, Storage of Battery water, battery bank etc.	Storage of equipment, transformers, oils, fuels, battery water, other chemicals, battery bank at the project site for erection and filling.	Transformer bay and battery room	Contamination of land and or nearby water bodies by transformer oil, fuels, chemicals, battery water etc. can occur during erection and operation due to leakage or accident	Proper drainage facilities will be constructed to avoid overflow or contamination of water bodies, streams, river etc. especially during the rainy season. Storage of bulk fuel should be on covered concrete pads away from the public and worker camp. Fuel storage areas and tanks must be clearly marked, protected and lighted.	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during construction phase and periodic (e.g., monthly) monitoring during the operational phase.

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					Maintain account of the usage of oil through oil monitoring mechanism, and have mitigation plan for any oil spillage.			
14.	Control Room, Accessories and switchyard	Connectivity and internal wiring in Control room panels for bays. Storage of SF6 gas cylinders.	Substation switchyard	Short circuits, fire due to improper connectivity, overload or accident. Inapt storage of SF6 gas cylinders, untracked leakage of SF6 from equipment.	Ensure correct connectivity of wiring, availability of firefighting equipment maintained in working order at construction site. Ensure fully trained personnel handle interconnections, wiring, chemicals, tracking of leakage of SF6 from circuit breakers etc.	Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during construction phase and periodic (e.g., monthly) monitoring during the operational phase.
Commissioning								
15.	Charging Power Transformer, Auxiliary power supply	Erection, filling of oil and charging the power transformer	Switchyard	Leakage of transformer oil and sparking due to loose connections from standby power set	Concrete lined pits are erected to contain the oil. Firefighting equipment maintained in working order at site	Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during the commissioning phase, followed by periodic checks (e.g., quarterly) during the operational phase

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
16.	Communication, Power Line Carrier Communication	Connectivity and internal wiring in Control room panels for bays.	Location: Control Room, Switch yard	Remote operation of substation and line jeopardized due to faulty installation.	Proper safety protocols implemented while installation of communication equipment	Contractor	PMC, PIU & PMU (AEGCL)	Regular inspections during installation and commissioning, followed by periodic checks (e.g., monthly) during the operational phase
17.	Connecting terminating lines into substation equipment Restoration of soil, slope stabilization, green belt development, Testing and Commissioning	Connecting jumpers between the suspension clamps on incomer lines to the bus bar, and drop down to power transformer via isolators, CT, PT, CB etc. Connecting of cable spacers and other accessories on the power cable.	Substation	Improper connections, improper spacing and distance from nearby structures causing faults. Increase in soil runoff, soil erosion due to improper slopes, blockages in drains and slopes. Impact on terrestrial ecology and migratory birds.	Proper connectivity of jumpers and clamps to avoid short circuit faults. Ensure impact on human environment, health and safety norms are followed during erection and testing and commissioning. Restoration of soils, removal of blockages from drains, slope and gulley's, cleaning of all construction material leftovers and proper green belt development. An Emergency Action	Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during the connecting and terminating phase, followed by regular inspections (e.g., quarterly) during the operational phase

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					plan and OHS Management should be prepared and followed incorporating occupational health safety measures such as safety routines, lockouts, tag-outs, work permits, etc.			

Table 33: Environmental and Social Management Plan for Transmission Lines

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
Pre-Construction								
1	Route Survey	Enumeration of trees for cutting, identification of locations for digging of soil for tower base, development of quarrying sites, stacking area for construction material etc. Avoidance of public/private structure, public utilities, common property resources etc. as far as possible.	Tower Base and RoW of Transmission line	Potential impact on - private land, agriculture land & livelihood, other Physical resources- Topography, possible loss of biodiversity, interference with public utilities.	Better choice of route alignment and tower bases to avoid adverse impact to private & public utilities, common property resources, biodiversity, etc. Advance notice to the public about the time and the duration of the utility disruption and restoring the utilities immediately to overcome public inconvenience, if disturbance to common property resources/ public utilities is unavoidable.	Surveyor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the survey phase, especially in ecologically sensitive areas.
2	Forest Case Preparation and Preliminary Survey	Marking of trees/vegetation for cutting at the tower base and for trimming inside the right of way, access roads to Transmission	Tower	Potential impact on physical resources, topography during construction and loss of tree cover which would lead to erosion, landslips and landslides in	Proper clearance from appropriate agencies such as railways, roads, airports etc. Planning for compensatory	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during marking and preparation activities

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		Tower Sites etc. Identify impact on forest dwellers (if any)		hilly areas causing topographical impacts creating gullies, ridges etc.	afforestation in consultation with Forest Department in consonance with watershed development plans of the area.			
3	Detailed Surveys	Land owner identification for transmission line corridor and towers located in agricultural fields, forest areas, portions of houses/ buildings falling in tower foundations.	Tower Base and RoW of Transmission line	Potential impact on - private land, agriculture land & livelihood, resettlement, other Physical resources- topography, possible loss of biodiversity, soil erosion, land slips/landslides in the area.	Potential tower locations can be deviated by at least 5-10 m sideways to avoid transmission line directly over the houses, or any existing asset which would negatively impact the land owner.	EPC Contractor	PMC, PIU & PMU (AEGCL)	Monitoring as required during the pre-construction phase, especially for tower locations in various terrains.
4	Soil Investigation, other environmental baseline information	Collection of soil samples by digging manually/using machines as well as collection of water from wells/water sources nearby RoW	Tower Base	Minor impact of collection of soil samples on topography or pollution of water source during sample collection	Avoidance of marshy areas, low-lying areas, riverbeds, earth slip zones that would involve risk to stability of the foundations. Baseline development will help in monitoring environmental	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during the pre-construction phase, with periodic assessments

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					parameters on a regular basis during construction period. Reduces potential impact on environmental resources in the area- air quality, noise quality, ground water quality and surface water quality during construction.			
Facilities Set-up								
5	Temporary Worker Camps	Scatter of kitchen waste, toilet waste, scrap, unusable/non-recyclable waste in the area. Solid waste disposal, liquid waste disposal in camps, spillage into river, streams. Poaching of animal life, fishing, harvesting of wood by workers.	Worker Camp	Oils, untreated wastewater, sewage etc. flowing into water body, river, drainage areas from the camps causing impact to surface water, ground water, any aquatic life downstream. The downstream water in river can be polluted making it unfit for bathing or potable water. The camps can also adversely impact on ecological resources	Contract provisions specifying minimum setback requirements for construction camps from water bodies, reserved areas etc. Engineering Procurement and Construction (EPC) contractor can provide liquefied petroleum gas cylinders for cooking etc. to workers. Provision of adequate washing and toilet facilities by the	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring, at least weekly, during the construction phase

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				through poaching of wildlife and using wood from trees as firewood causing ecological damage in the area.	contractor to the workers should be made obligatory. Labour-Camp Management Plan and a Construction Waste Management will be followed.			
6	Transportation and unloading of material at site, storage and workshop	Levelling of soil for creation of storage place. Transportation of construction materials and equipment to sites using heavy cranes to unload/ load equipment (Storage areas, Tower Bases) Toilet waste, scrap, unusable/non-recyclable waste, oils, sewage, slurry from machines, dripping oils from trucks etc.	Construction Sites, Workshops, stores, machine shops and access roads	Nuisance to the people by the way of noise vibration and dust. Levelling of soil, vehicular emissions impacts air quality/noise levels in the area. Cutting of trees, soil erosion will impact terrestrial ecology of the area. Workshop wastes impacts ecological resources due to unplanned solid waste, unsafe wastewater, other liquid waste disposal flowing into water bodies, drainage etc.	Selection of locations for material storage yards and Workshops established away from any environmental sensitive areas. The vehicles used at the site must be compliant with pollution standards. Protective equipment (PPE) for handling of material and in the workshop is required. Preparation and implementation of Traffic Management Plan (TMP) by mapping sensitive locations such as educational and health care	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during material handling activities

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		Welding, cutting and fabrication of raw material etc.		affecting the ground water, aquatic ecology of water bodies in the area.	institutions, community structures, market areas etc.;			
Construction								
7	Pit Marking, digging of foundation	Clearing of land for tower in agricultural fields or hilly areas. Improper soil type encountered making the tower footing very huge and contour specific. Pile foundation in case of marshy lands, hilly and river basins may be required. Stacking of dug up soil, usage of digging machines for foundations.	Tower Foundation	Impact on physical resources, topography during construction - loss of trees would lead to erosion, landslips and landslides in hilly areas creating gullies, ridges etc.) Ground and surface water quality, aquatic ecology may be affected due to surface soil run-off, dripping of oils from engines of digging machines. Impact on environmental resources- air quality/noise levels due to use of machinery for digging or stacking of loose soil. Loss of agricultural	Ensure proper drainage, proper soil type to ensure minimum tower base footing due to contour, tower alignment, distance from trees, sensitive areas. Ensure minimum noise generation at digging points.	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during excavation activities

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				land would impact on human environment				
8	Construction of Foundation, Revetment	Digging and concrete casting of foundations for Towers Surface run-off of pre-stacked soil, oil leakages from engine and vehicles. Steep contour, improper soil type encountered	Tower base	Ground and surface water quality, aquatic ecology may be affected due to surface soil run-off, dripping of oils from engines of digging machines. Steep contour, improper soil type encountered making the tower footing very huge and contour specific requiring revetment.	Restoration of the loose soil from foundations through ramming. Excess soil can be laid out in areas that do not interfere with local drainage pattern. For any revetment structure, the weep holes may be placed to ensure water/moisture shall pass through easily without damaging the structure.	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during construction, with periodic assessments
				Injury and sickness of workers and members of the public; Incidents/accidents; Gender Based Violence /Sexual Exploitation Potential conflict between migrant workers and local inhabitants.	An OHS Management plan will be prepared by OHS Expert of PMC and the same has to be implemented by the concern OHS officer of EPC Contractor. Also, OHS officer of EPC contractor should arrange occupational health	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during construction, with periodic assessments

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					and safety awareness programmes including AIDS and sexually transmitted diseases (STD). Potential conflict between migrant workers & local inhabitant to be addressed through workshops to workers regarding local customs, and codes of conduct.			
Erection								
9	Pre-Erection Checks	Shifting of distribution lines, water supplies, cutting trees etc. under the planned right of way. Disbursement of compensation for tower base and T/L corridor as determined by revenue circle/ district administration.	Tower base and Right of Way	Disturbances to local population due to temporary outages of power as distribution lines are disconnected. Utilities such as water supply etc. may be disturbed because of the above.	Re-routing of public utilities affected by the transmission line – distribution lines, power lines, telecom lines etc. Compensation for land, zirat etc. before commencement of construction work (wherever require)	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the pre-erection phase, especially when utility lines are being rerouted
10	Erecting towers, arms, Erection,	Personal Protective	Tower	Unsafe erection of tower can result in	Use of proper PPE for workers, safety	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	Tightening and Punching	Equipment (PPE's) not used by workers and not available to nearby residents. Adequate distances not maintained from neighboring properties and structures. Loose soil left unattended after completion of erection of tower.		injuries to the workers and residents in the area. Untrained workers can lead to more accidents and fatalities. Weather conditions in hilly areas could result in tower failure or topple partially or fully during erection and stringing due to uneven stringing loads, severe wind conditions.	protocols during erection process must be observed. Proper on-site training to staff and residents must be provided by EPC contractor. The EPC contractor will ensure proper design of tower structure to avoid accidents due to toppling (partially or fully) takes place during erection and stringing due to uneven stringing loads, severe wind conditions.			during tower erection, with frequent checks on safety measures
11	Earthing, clipping and fixing of accessories, installation of OPGW (Optical Ground Wire)	Installation of Earth wire and Accessories. Earthing the tower and the conductor.	Tower	Accident at tower site due to falling of accessory, snapping of earth- wire of incorrect tensioning etc. Impact on safety of workers due to lack of PPEs. Improper refilling of soil at earthing location may cause	EPC contractor must ensure proper PPEs are worn by work staff and safety protocols for earthing, accessories and installation of OPGW are followed. Ensure proper earthing and maintaining specified distances from the under-erection earth	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the installation of earthing and accessories

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				soil run-off.	wire in case the tower line is passing over another live transmission or distribution line.			
Commissioning								
12	Stringing and final sagging and tensioning of earth-wire and power conductor, Testing and Commissioning	Stringing of cable onto the erected towers, accessories manually or using equipment. Addition lopping of trees required within the ROW.	Tower line	Snapping of stringing blocks, unbalance load during stringing on tower leading to collapse, falling cables injuring workers, others etc. Stringing the wire loosely may result in cable touching the ground and other obstructions that could cause damage. Extensive lopping of branches etc. in hilly terrain may be required to maintain ROW as compared to lines running over level ground.	Proper tension maintained between the tensioner and the puller keeps the conductor clear of the ground and other obstructions that could cause damage. Scaffolding shall be used where roads, rivers, channels, telecom lines, overhead power lines, railway lines, fences or walls have to be crossed during stringing operations. No. of trees to be lopped needs to be ascertained	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during stringing operations
				Disturbance to avifauna species due to collision with transmission line, electrocution to	Deflectors and line markers need to be installed at the identified location of the transmission line	EPC Contractor /PIU & PMU (AEGCL)	PIU & PMU (AEGCL)	Throughout operations

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				wildlife including avifauna.	– which is falling 10 km in the vicinity of Wildlife sanctuary/potential Migratory Bird route. Maintenance of sag line to 9 m height, barbed wire around towers in area with population of animals. Monitoring of transmission line especially for bird strikes during the operation and use of deflectors if required. If the monitoring shows that certain areas of the transmission line show increased bird carcasses, additional bird flappers might have to be installed. A routine for record keeping of bird carcass with details around numbers, species, and season is			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					to be maintained by AEGCL and regularly analysed to determine the need for any enhanced mitigation measures.			

Table 34: Environmental and Social Monitoring Plan (ESMoP)

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
1. Air Quality	A. Pre-construction stage	PM_{10}, $PM_{2.5}$, CO, SO_2, NO_2, O_3, and NH_3 along with Meteorological parameters like-temperature Humidity, wind speed, wind direction etc.	Substation Location	National Ambient Air Quality Standards (NAAQS), CPCB	PMC by CPCB/SPCB approved or NABL Accredited laboratory	PIU & PMU (AEGCL)	Once
	B. Construction Stage				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
2. Water Quality (Both Surface Water and Ground Water)	A. Pre-construction stage	As per IS: 10500 (PH, Colour, Odour, Taste, TDS, Conductivity, Turbidity, BOD, COD, Total Hardness, Alkalinity, Nitrate, Sulfate, Fluoride, Chlorine, Arsenic, Copper, Cadmium, Lead, Iron, Zinc, Coliform, E.Coli.	Nearest downstream spring and handpump within the Substation Location	As per IS: 10500	PMC by CPCB/SPCB approved or NABL Accredited laboratory	PIU & PMU (AEGCL)	Once
	B. Construction Stage				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
3. Noise	A. Pre-construction stage	Noise level (dB level) On hourly basis for 24 hours	At identified sensitive receptor level in the vicinity of Substation Location	As per CBCB and WHO guidelines	PMC by CPCB/SPCB approved or NABL Accredited laboratory	PIU & PMU (AEGCL)	Once
	B. Construction Stage				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
4. Soil	A. Pre-construction	PH, Moisture, Conductivity, Oxidation	Substation Location	As per CBCB and IS guidelines	PMC by CPCB/SPCB approved or NABL Accredited laboratory	PIU & PMU (AEGCL)	Once

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	stage	Reduction Potential, Nitrogen, Phosphorous, Sulphate, Chloride, Total Organic Carbon, Nitrate, Arsenic, Cadmium, Lead, Iron, Zinc, Copper, Total Coliform.					
	B. Construction Stage				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)				EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
5. Traffic	A. Pre-construction stage	Number & type of vehicles being used for procurement of construction materials and supply items	At identified sensitive location/ stakeholders as, mapped in the TMP in the vicinity of the Substation Location and Transmission Line Route	Record keeping of vehicles used to identify increased traffic load in localities	EPC Contractor and PMC	PIU & PMU (AEGCL)	Continuous activity
	B. Construction Stage			Logbook for in-out time of vehicle on site (substation and transmission line routes)	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
	C. Operation Stage (Commissioning Stage)			Maintenance of Logbook for in-out time of vehicle on site (substation and transmission line routes)	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
6. Tree cutting	A. Pre-construction stage	Enumeration of trees during detailed survey of transmission line route and after finalization of layout plan of selected substation area	Substations & Transmission line routes	Documentary evidence to be maintained by surveyor and EPC Contractor for counting of trees	Surveyor/EPC Contractor	PMC, PIU & PMU (AEGCL)	Once during detailed survey and layout design development
	B. Construction Stage	Development of inventory of tress before starting stringing for transmission lines and before initiating the substation construction		Marking of tress by concerned authority in presence of EPC contractor and AEGCL officials. Obtaining applicable clearance	EPC Contractor	PMC, PIU & PMU (AEGCL)	Once during construction phase

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				from forest department in case tree cutting is involved.			
	C. Operation Stage (Commissioning Stage)	Pruning/cutting of tress for maintenance activity		Maintenance of minimum clearance between conductors and trees. Obtaining applicable clearance from forest department in case tree cutting/pruning is involved.	PIU, AEGCL	PMU, AEGCL	Continuous activity
7. Carcass	A. Pre-Pre-construction stage	Visual inspection for substation locations and RoW of Transmission Line during detailed route survey	Substations& Transmission line routes	Identification carcass (animals/birds) to be reportedto concerned forest/wildlife authority for identification of species. Record to be maintained for number of carcasses	Surveyor	PMU, AEGCL	Continuous activity
	B. Construction stage	Visual Inspection for substation and transmission line route during construction activity	Substations& Transmission line routes		Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
	C. Operation Stage	Visual Inspection for substation and transmission line route during maintenance activity	Substations & Transmission line routes		AEGCL–Field Staff	PIU & PMU (AEGCL)	Continuous activity
8. Grievance Mechanism	A. Pre-construction stage	Identification of officials, NGO, stakeholders to be part of Grievance Redressal Committee	All Project Locations	Notification of formulation of GRM and GRC and display of GRM procedure in project locations	EPC Contractor and PMC	PIU & PMU (AEGCL)	Continuous activity
	B. Construction Stage	Working files of GRC and GRM records			EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
	C. Operation	Working files of GRC and			EPC Contractor	PMC, PIU & PMU	Continuous

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	Stage (Commissioning Stage)	GRM records				(AEGCL)	
9. Compensation	A. Pre-construction stage	Identification of project-affected people	All project locations	Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013, IFC's Performance Standard 5. The Indian Electricity Act, 2003, The Telegraph Act, 1885 for compensation of tower footing & transmission line RoW.	PMC, PIU & PMU (AEGCL), EPC Contractor	PMC, PIU & PMU (AEGCL)	During detailed route survey and identification of land parcel
	B. Construction Stage	Mapping and listing of projects affected people (crop damage (area m^2), zirat damage (marking of trees & development of inventory), land acquisition (area m^2). And disbursement of compensation. (if applicable)	All project locations		EPC Contractor, PMC & PIU (AEGCL)	PMC, PIU & PMU (AEGCL)	Before commencement of work in area of impact
	C. Operation Stage (Commissioning Stage)	Marking of tress (enumeration) to where pruning/cutting is required to maintain clearance between trees and conductor.	All project locations		PIU (AEGCL)	PIU & PMU (AEGCL)	Continuous activity
10. Stakeholder Engagement	A. Pre-construction stage	Mapping of stakeholders	Substation and Transmission Line routes	Consultation record with mapped stakeholders (minutes of Consultation and attendance sheet)	DPR Consultant	AEGCL-PMU/ AEGCL Fieldofficials & PMC	Continuous activity
	B. Construction stage	Listing of identified stakeholders (administrative and project affected people)	Substation and Transmission Line routes	Consultation record with mapped stakeholders(minutes of Consultation and attendance sheet)	Contractor/PMC/AEGCL	AEGCL-PMU/AEGCL Field officials & PMC	Continuous activity
	C.Operation	Identifiedstakeholdersatpr	Substation	Consultation record	AEGCL FieldOfficers	AEGCL- PMU/ AEGCL	Continuous activity

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	Stage	oject pre construction andconstructionstage	andTransmission Line routes	with mapped stakeholders(minutes of Consultation and attendance sheet)		Field officials & PMC	
11. Livelihood	A. Pre-construction stage	Identification of any impact on livelihood due to acquisition of land, crop damage and zirat damage.	Substation and Transmission Line routes	As specified in the Rightto Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 and IFC's Performance Standard 5	Revenue Department &AEGCLconcerned divisional officer, PMC, EPC Contractor	AEGCL PMU/PMC& AEGCLField Officials	Once during detailed route survey and identification of land parcel for Substation
	Construction stage	Identification of any impact on livelihood due to loss of land (area m2) land utilization pattern, crop damage (area m2 and type of crop) and zirat damage (Inventory development)	Substation and Transmission Line routes		Revenue Department & AEGCL concerned divisional officer, PMC, EPC Contractor	PMU/PMC & AEGCL Field Officials	Before commencing construction work
	C.Operation Stage	Identification of any impact on livelihood due to acquisition of land, crop damage and zirat damage (inventory development)	Substation and Transmission Line routes		Revenue Department &AEGCLconcerned divisional officer	PMU/PMC&AEGCLField Officials	AEGCL Continuous activity
12. Restoration	A. Pre-construction stage	Identification, marking and listing of any damage to public utilities and public/private property to be envisaged during construction phase	All project locations	Once as specified in the RighttoFai Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 and IFC's Performance Standard 5	Revenue Department &AEGCL concerned divisional officer, PMC, EPC Contractor	AEGCL–PMU/PMC& AEGCLField Officials	Once during detailed survey of transmission Line and identification of land parcel for substation location
	Construction stage	Restoration of project affected public utilities andpublic /private Property to its previous condition or to an improved state.	All project locations		Revenue Department & AEGCL concerned divisional officer, PMC	AEGCL–PMU/PMC & AEGCL Field Officials	Continuous activity
	C.Operation	Functionalities of	All project locations		Revenue Department & AEGCL	AEGCL	Continuous activity

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	Stage	restored public utilities/shifted public utilities and public/private property			concerned divisional officer	PMU/PMC & AEGCL Field Officials	

5.6 Budget for implementation of ESMP

The detailed breakdown of costs provided in the**Table 35** reflects the conscientious planning and allocation of resources within the Environmental and Social Management Plan (ESMP). Each component is carefully considered, ensuring that the financial provisions align with the specific needs of the project, addressing identified environmental and social risks throughout the various stages of its lifecycle.

Table 35: Budget for Implementation of ESMP[19]

Sl. No.	Description	Quantity	Unit	Rate (in INR)	Amount (in INR)
A.	***Environmental Monitoring (Pre-construction Stage)***				
1	Air Quality	14	No.	21,440	300160
2	Water Quality (Surface and Ground water both)	14	No.	25,360	355040
3	Noise Levels	14	No.	7,000	98000
4	Soil Quality	14	No.	12,300	172200
	Sub-Total Cost				**925400**
B.	***Environmental Monitoring (Construction Stage)***				
1	Air Quality (Twice a year for 3 year)	84	No.	21,440	1800960
2	Water Quality (Twice a year for 3 year)	84	No.	25,360	2130240
3	Noise Levels (Twice a year for 3 year)	84	No.	7,000	588000
4	Soil Quality (Twice a year for 3 year)	84	No.	12,300	1033200
	Sub-Total Cost				**5552400**
C.	***Environmental Monitoring (Operation Stage)***				
1	Air Quality	14	No.	21,440	300160
2	Water Quality (Surface and Ground water both)	14	No.	25,360	355040
3	Noise Levels	14	No.	7,000	98000
4	Soil Quality	14	No.	12,300	172200
	Sub-Total Cost				**925400**
	Total Cost (A+B+C)				**7403200**
D.	***Capacity building (Training/ Workshops) and Health Awareness Camp***				
1	Training on Implementation of ESMP for PMU and PIU (Once per year for 4 years) EPC contractors: (Twice per year for 4 years)	12	No.	2,00,000	2400000
2	Health & Safety Awareness Camp: Pre-Construction- Once Construction- 2 times / year for 4 years Operation- Once	140	No.	50,000	7000000
3	Training on Implementation of GRM (Bi-annually for 4 years)	96	No.	20,000	1920000
4	Training on Occupation Health and Safety (Quarterly for 4 years)	224	No.	20,000	4480000
	Total Cost				**15800000**
E.	***External Monitoring Agency (EMA)***				
1	Mid Term Environmental and Social Audit	1	No.	50,00,000	50,00,000
2	End Term Environmental and Social Audit	1	No.	50,00,000	50,00,000
	Total Cost				**1,00,00,000**

[19]The cost estimate is for implementation of ESMP covering all sub-projects under Phase-II.

Sl. No.	Description	Quantity	Unit	Rate (in INR)	Amount (in INR)
Grand Total (A+B+C+D+E)					***3,96,81,000***

Note:

- *Considering the quantum of civil work in transmission line sector, the quantitative monitoring for Air Quality, Noise Level and Water quality is limited to substation locations only. The proposed trainings, health and safety awareness camps, GRM training are to be organized collectively for individual substation and associated transmission lines, covering all the proposed 14 sub-station locations. The detailed project components are specified in project description section of this report.*

- *The proposed ESMP Budget doesn't include the cost Estimate for wire insulation and provision of Bird Deflectors. The proposed ESMP budget also doesn't include the budget for civil works (development and implementation of drainage layout plan, development of storage facility, construction of oil pits, repair of slabs etc.) and procurement and installation of equipment's (lightening and illuminating devices, personal protective equipment's, fire protection equipment's and devices, SF6 retrieving arrangement etc.).*

Chapter 6: Climate Risk & Vulnerability Assessment

6.1 Introduction

This Chapter presents profile of the climate risk assessment for the State of Assam. It is envisaged that the assessment of the hazards and risks that the vulnerable communities face on the ground at the Gram Panchayat (GP)/village level. Assam, due to its unique physiographic and climatic conditions, is one of the most disaster-prone areas in the country. The state of Assam is prone to multiple natural hazards such as earthquakes, floods, landslides, cyclones and occasional droughts. In this context at first climate risks have been identified for the state followed by the project risks due to climate change.

6.2 Climate Variability and Climate Change in Assam

Assam is expected to be highly prone to the impact of climate variability and change. The main characteristics of climate change include rising temperatures, changes in rainfall pattern and an increased intensity and/or frequency of extreme events. These changes in physical processes have impacts on biological and socio-economic factors such as: shifts in crop growing seasons; changes in disease vectors; increased rates of extinction of many species; severe water shortages; and heavy deluges and flooding.

Climate projections for Assam show the projected changes in various climate parameters till mid-century as per ASDMA 2022 page 57. Temperatures continue to rise and may increase by 1.7-2.0 C with reference to base line (BL). Only the western part of the State will experience slight decrease in rainfall but the rest of Assam is projected to have increase in rainfall. There is likely to be increase in extreme rain fall event by 5% to 38% w.r.t.to base line. Droughts weeks are going to rise, with Southern districts showing marginal reduction in drought weeks but rest of the district show an increase by more than 75% with reference to BL Flooding events are going to rise by more than 25% in the southern parts of Assam. **Table 36** below presents projections on the temperature and rainfall projections till 2050.

Table 36: Climate Projections for Assam and North East States

Temperatureand Rainfall	2021to 2050 with reference toBL	Remarks
Mean Temperature	1.7-2.0 C	Across Assam
Annual Rain fall	5 to 38%	North western districts
	5-10%	North Eastern districts
	10-25%	Central, South Eastern District
Extreme rainfall days	5-38%	Rainfall >25 to 150 mm
Drought weeks	25% to >75%	Southern districts show marginal reduction in drought weeks but rest of the districts show an increase by more than 75% wrt BL
Floods	Stream flow <10 % to > 25%	Min in North East and Max in Southern part of the State

Source: Climate Vulnerability Assessment for the Indian Himalayan Region Using a Common Framework 2018-19

Vulnerability of the State to Climate Change and Risk Analysis

Vulnerability encompasses a variety of concepts including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. Therefore, the inability to cope with changing climate conditions is generally contextual and is a characteristic of the existing developmental paradigm, and that of the social and ecological systems amongst others.

1. Physical Vulnerability

- 31.98% of the State's population lived below the poverty line (2011-2012), with majority of the population, especially the people living in interior rural areas, in areas inhabited by Scheduled Caste & Scheduled Tribe population, tea garden areas and far flung "char" (riverine) lack facilities of safe drinking water, sanitation etc. These developmental gaps contribute to the communities' vulnerability to climate change.
- Small islands in the Brahmaputra and Barak River basin are isolated from the rest of Assam and have no permanent health care facilities and are prone to frequent flooding as climate change continues, these islands will become increasingly vulnerable.
- Primary sector comprising of agriculture, fisheries and forests, which together contribute 34% of the GSDP, and combining mining and quarrying the primary sector has a share of 42% in the total GSDP of the State. Climate change will impact agriculture, fisheries, forest and affecting food security, income and livelihood of people.
- Practices such as over exploitation of ground water, Jhum cultivation in hilly areas, mono cropping etc. and recurrent floods and droughts have been putting pressure on the agriculture system. Exacerbations of climate change induced hazards are likely to further make the agriculture production system of the State uncertain.
- The predicted increase in average temperature and decrease in the number of rainy days due to climate change will further stress water resources.
- Dependency on fuel wood, mining, logging, urbanization, encroachment, higher frequency Jhum cultivation etc. are some of the developmental factors leading to degradation of forests. As floods and droughts are likely to intensify, it is very likely that a further reduction in forest cover may occur in these areas and may amplify the impacts on agriculture, water resources and the composition of the remaining forestland.

2. Economic Vulnerability

The anticipated economic impact of climate change in Assam will be as follows

- Agriculture and horticulture contribution to State GDP (SGDP) will be reduced by about 2%, partly as a result of temperature trends and partly because of more variable and unpredictable rainfall.
- Climate change will result in more frequent and severe floods which will increase the costs of reconstruction and maintenance on State infrastructure, including roads, irrigation, water and sanitation. The economic cost of climate change on infrastructure would grow to between 0.3% and 0.9% of GDP by 2050.
- The increase in flooding will also increase loss and damage to domestic and industrial property and will affect labour productivity and result in increased health burden and loss of life and injury.
- Loss and damage in the forestry sector is likely to be higher than average in Assam, because of the large forest area.
- World Health Organization (WHO) suggests that climate change in tropical areas is likely to increase the incidence of climate sensitive diseases by about 10%.

3. Environment and Eco-System Vulnerability

- With glacial contribution decreasing over the years, future lean season flow (low flow) may decrease in the Brahmaputra basin leading to increased water stress and changed hydrological regimes of the rivers as well as altered eco-hydrological characteristics of the riparian ecosystems. As a result, agriculture on which large populations depend for livelihoods and diverse ecosystems that sustain a rich biodiversity and food security in the state may be jeopardized.
- Important forest ecosystems (especially grassland and wetland environs) on river banks such as those in Kaziranga, Manas, Pobitora, Burhachapori, Panidihing and DibruSaikhowa may see changes in the normal mode of land water interactions which may have significant detrimental effect on the microenvironment characterized by temperature, soil moisture, humidity on which the sustenance of many wild flora and fauna depends.

6.3 Natural Hazards

6.3.1 Earthquakes

Assam falls within an earthquake prone zone (BIS Seismic Zone IV and V) as per ASDMA 2022 page 33. The State of Assam has experienced several devastating earthquakes in the past resulting in a large number of deaths and severe property damage. Active seismicity of the North Eastern region has caused extensive landslides, rock falls on the hill slopes, subsidence and fissuring of ground in the valley, and changes in the course and configuration of river tributaries of Brahmaputra and Barak river systems. These changes, especially in river morphology have a significant impact on the hydrologic regime and vulnerability of the communities which are in its proximity and are dependent upon this natural system as their source of livelihood.

There is a recorded history of around twenty destructive earthquakes which have affected this region in the past century. Earthquakes, during non-instrumental period in Assam, occurred in the years 1548, 1596, 1601, 1642, 1663, 1696, 1756, 1772, 1838, & 1841. The complex tectonic and geology set up of the region can produce earthquakes of magnitudes 8 and above every few hundred years (Mahajan, 2010). The earthquakes of Magnitude 6 and above measured during instrumental period in Assam are presented in **Table 37**.

Table 37: Earthquake Hazard History of Assam State (M>6.0)

Date	Epicenter	Latitude	Longitude	OriginTime	Magnitude
10Jan1869	9.4KmNofKumbhir (Assam)	25.00 N	93.00E	11:45UTC/17:15 IST	7.5
21 January 1941	NearTezpur,Assam	26.50 N	92.50E	02:30:16.0UTC	6.5
23October 1943	13.6kmsEofHojai(Assam)	26.00 N	93.00E	17:23:17UTC/ 22:53:17IST	7.2
31December 1984	SSEofSilchar (Assam)	24.64 N	92.89E	23:33:37UTC	6.0

Source: https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

Table 38: Some of the recent earthquakes

Date	Epicenter	Latitude	Longitude	OriginTime	Magnitude
9 Dec2004	SilcharRegion, Assam	24.710 N	92.523E	08:49:00UTC	Mw 5.4
19 Aug 2009	AssamRegion	26.556 N	92.470E	10:45:13UTC	Mw 5.0
30Dec2011	CentralAssamregion			15:14:0UTC	M 3.6

Date	Epicenter	Latitude	Longitude	OriginTime	Magnitude
25Sept2018	Barpeta			03.47UTC	M 4.3
27April2019	Tejpur			06.27UTC	M 4.8
13 Nov 2019	Diphu			13.10UTC	M 4.7
8Feb2020	Abhayapuri			12.47UTC	M 5.0
3Oct2020	Hajo			15.36UTC	M 4.2
10Dec2020	Goalpara			16.56UTC	M 4.3
17Feb2021	Dhekiajuli			12.24UTC	M 4.7
28April2021	Tejpur			02.21UTC	M 6.4

Source:
https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

Table 38 above clearly indicates the frequency of past earthquake incidents and high seismic vulnerability of Assam. Among the above listed earthquake events, the 1950 Assam earthquake with 8.6 magnitude was the most destructive in the last century. The epicentre was located in the Mishmi Hills south of the Kangri Garpo and just east of the Himalayas in the North-East Frontier Agency part of Assam, India. Occurring on the evening at 7:39 PM (IST) on 15th August 1950 earthquake claimed lives of approximately 4,800 people. The earthquake is notable as being the largest recorded quake caused by continental collision rather than subduction, and is also notable for the loud noises produced by the quake and reported throughout the region.

According to studies, 70 percent of the Himalayas could experience an extremely powerful earthquake. The prediction came from research of the historical records from the area as well as the presumption that since the 1950 Medog earthquake, enough slippage has taken place for a large earthquake to occur.

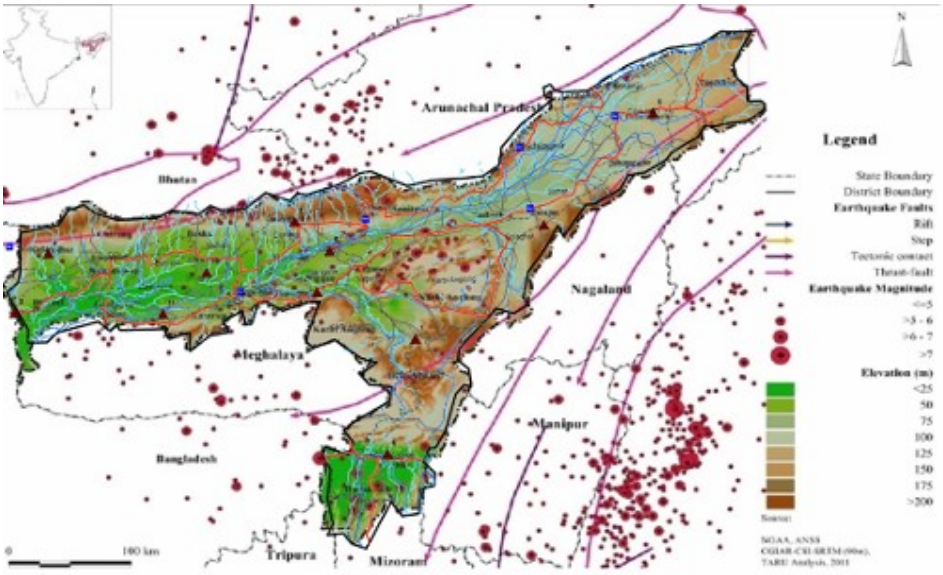


Figure 15: Seismo-tectonic Setup of Assam

Source:
https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

Figure 15 shows seismo-tectonic setup of Assam and indicates the sub projects sites of AEGCL and location of historical earthquakes within the region.

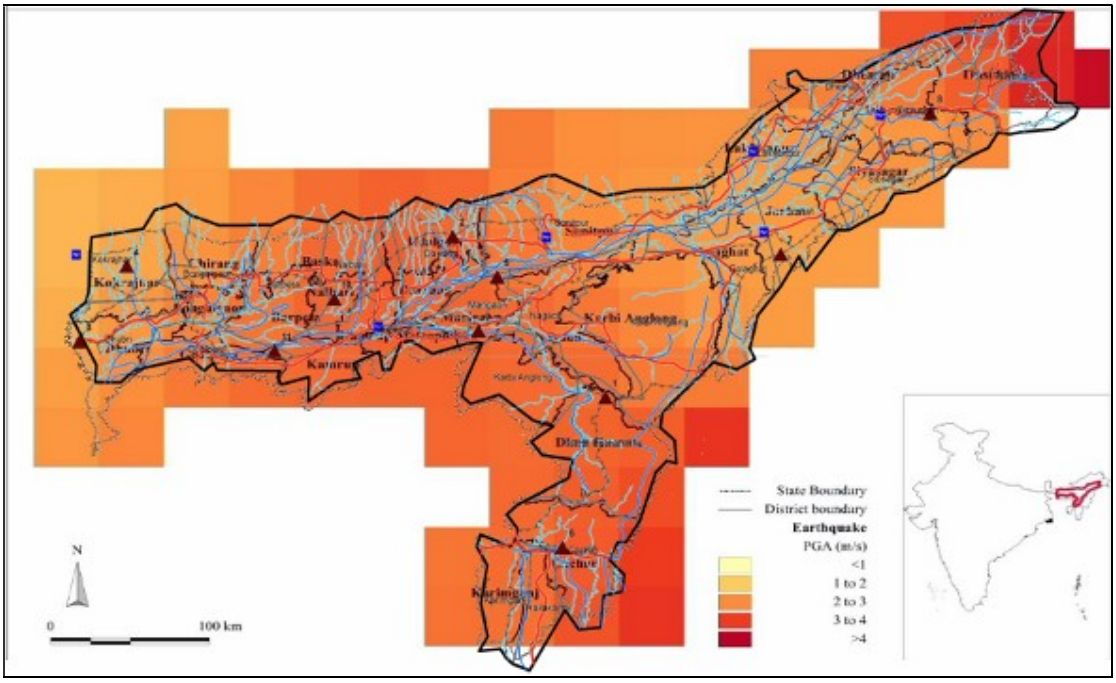


Figure 16: Peak Ground Acceleration

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

According to the Global Seismic Hazard Assessment Programme (GSHAP) data, the state of Assam lies in a region with high to very high seismic hazard. As per the 2002 Bureau of Indian Standards (BIS) map, this state also falls in Zone-V as per ASDMA 2022 page 37. Based on the hazard history and its zonation, much of Assam falls within high intensity zone i.e. IX or more based on Modified Mercalli Intensity (MMI) scale (which is a macro seismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence).

6.3.2 Floods

Assam comprises of a large network of rivers and tributaries originating from the upper catchments of the state with high gradient which joins the Brahmaputra and Barak rivers to form a highly dynamic and complex river system. High rainfall ranging from 1750 mm in the plains to about 6400 mm in the hills in the state and upper catchment causes severe floods in Assam. Multiple factors, such as excessive sediment load, large and variable flow, easily erodible bank materials, and aggradations of the channel, have been the possible underlying factors. Further, deforestation and human intervention in upstream and downstream areas of surrounding Hill States and Assam respectively have caused excessive siltation and runoff rate resulting in abnormal rise in the surfaces of major rivers. The flood prone area of the state is 31,500.00 Sq Km as assessed by the Rashtriya Barh Ayog which is about 39.58 % of the total land area of Assam. This is about 9.40% of total flood prone area of the whole country.

1. **Dam Induced Flooding**

Assam also witnesses flash floods caused by the release of water from dams upstream in Bhutan and neighbouring States in the northeast. Release of water from Doyang (Nagaland), Ranganadi (Arunachal Pradesh) and dams in Bhutan causes large scale inundation in Assam. The Ranganadidam has been the main cause of flash flooding in and around Lakhimpur district, adversely affecting the environment and socio-economic conditions of its people. In July 2017, water was released from the

Ranganadi dam without notice, catching the districts' administrations and 300,000 people off-guard. Flood waters damaged drainage channels under National Highway 15 between Lakhimpur and Dhemaji and washed away a 50-metre stretch of embankment at Bogalijan in Lakhimpur. Dam induced flooding is caused mainly because of human error. Timely communication by dam officials, early warning and emergency evacuation could save precious lives, property, prevent loss of lives and assets of people living in the downstream.

2. Flood Damage and Losses

The State of Assam faces regular flood year after year causing loss of lives, property, infrastructure and livelihoods of people. In the **Figure 17** below the affected population of Assam has been presented highlighting gravity of the flood hazard in the state over the years.

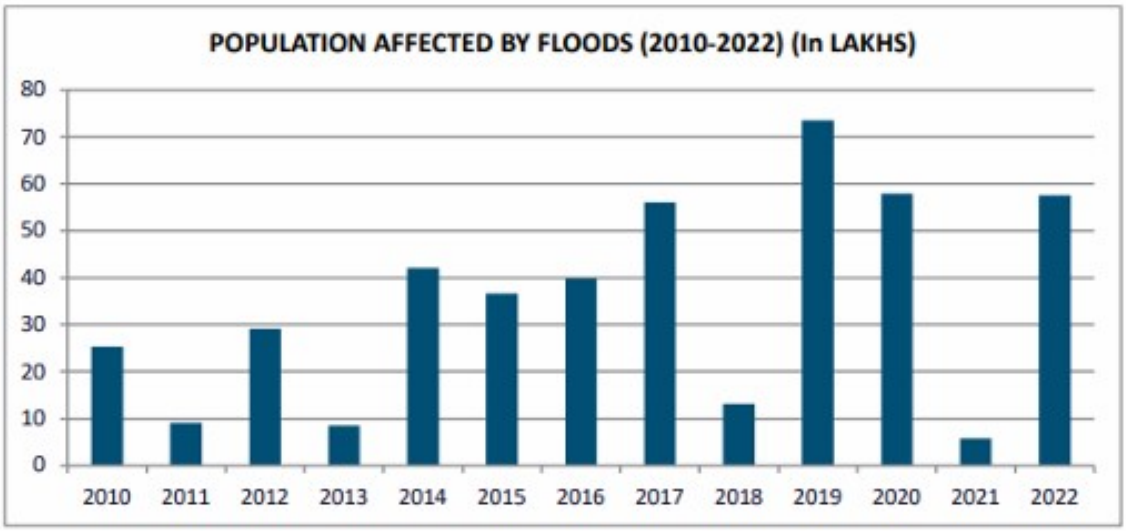


Figure 17: Population affected by floods (2010-2022) (In Lakhs)

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

Floods are a regular in Assam. But something peculiar has cropped up about them in recent years: They not only came early, but they stay longer as well. And worryingly, they have not been proportionated to the rainfall. According to State Action Plan on Climate Change (SAPCC), extreme rainfall events in Assam may increase by 5-38 percent and incidences of floods by 25 per cent during 2021-2050. The massive floods of June-July 2022 have highlighted the changing nature and impact of floods in Assam.

6.3.3 Landslides

Landslides are sudden, short-lived geomorphic events that involve a rapid-to-slow descent of soil or rock in sloping terrains. It can also be caused by excessive precipitation or human activities, such as deforestation or development that disturb natural slope stability. Landslides are caused when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. **Figure 18** and **Figure 19** shows the landslide affected areas and estimated population exposed to the event in Assam.

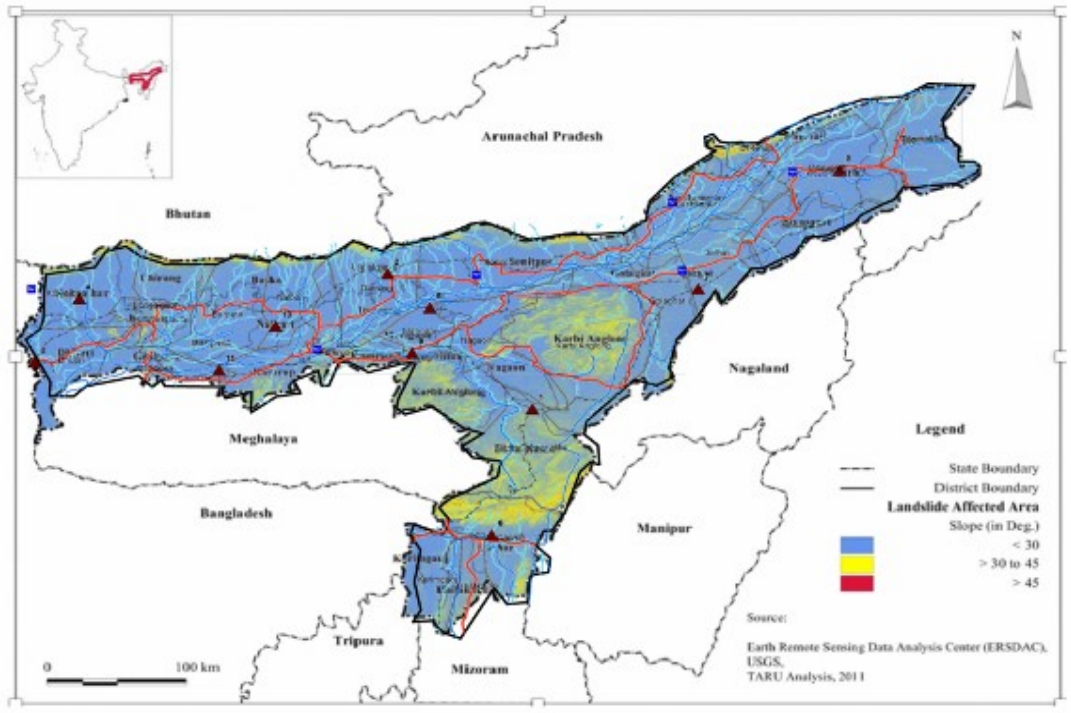


Figure 18: Landslide Affected Area in Assam

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

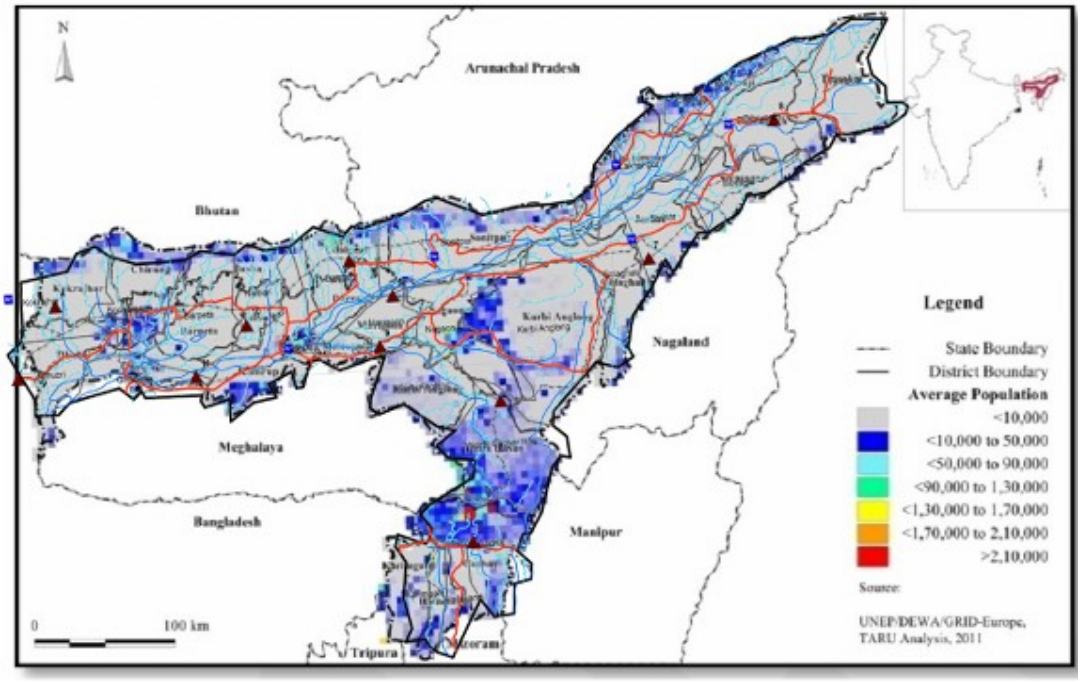


Figure 19: Landslide Affected Area in Assam

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

6.3.4 Erosion

the extent of erosion from 1988 to 2015, a bank line study of the river was carried out from satellite imagery by Brahmaputra Board in 2016. The study revealed that there has been an erosion of 739 sq. km against the deposition of only 209 sq. km during this period. Even this deposited land has no immediate value. Such land can be utilized for agricultural purposes only after the formation of the topsoil, which generally takes decades. A total of 2,534 villages were obliterated and 90,726 families rendered homeless during 1970 to 2016 period. Severe erosions still continue in a number of locations along the banks of Brahmaputra and many of its tributaries. Large damages to private and public properties including roads, bridges, embankments, buildings, power transportation infrastructures, homesteads, and cultivated land happen every year. In addition, intangible losses in the form of loss of forest areas, loss of daily wages/wasted time due to communication breaches are a common feature in the valley.

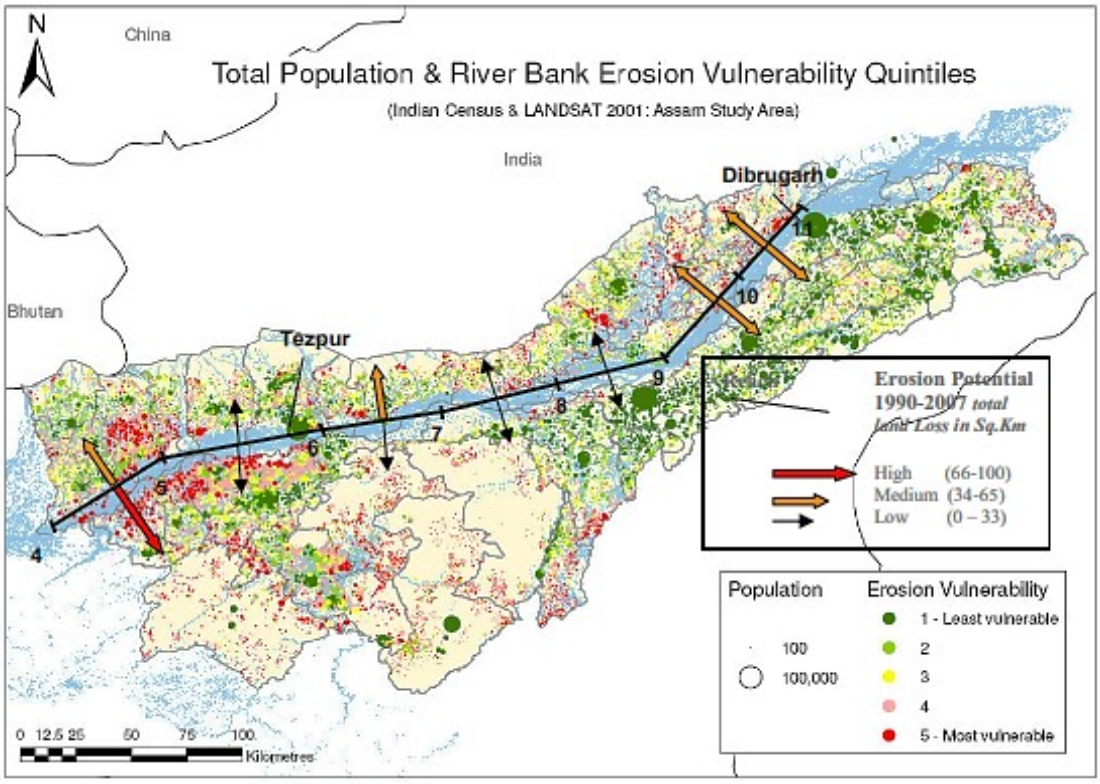


Figure 20: River Bank Erosion Vulnerability

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

According to the State Revenue and Disaster Management Department, as on July 2019, the area of land eroded till date has been the highest in Majuli (40,500 bigha) followed by Barpeta district (1,20,493 bigha), Kamrup (92,734 bigha, 5 katha, 71 lessa), Dhubri (87,036 bigha,9 katha, 43 lessa) and Dibrugarh (56186 bigha, 4 katha and 19 lessa). While in Morigaon district the number of displaced has been officially recorded at 18,425, in Majuli Island, as many as 10,500 people were noted as being displaced due to soil erosion. As per records, 9,337 have been mentioned as landless in Kamrup district. The lowest number of landless persons – two – has been stated to be in Charaideo district.

6.3.5 Wind and Cyclone

Assam is situated in the north eastern direction of Bangladesh which is highly prone to cyclone/winds. Every year about 60% of the area is affected by cyclones occurring in Bangladesh. Due to their specific locations, districts like Dhubri, Gaolpara, Hailakandi, Chachar and Karbi Anglong are more prone to cyclone/winds. Districts namely Kokrajhar, Bongaigaon, Kamrup, Barpeta, Nalbari, Darrang, Sonitpur, Nagaon, Marigaon, Lakhimpur, Dhemaji, Sibsagar, Jorhat, Golaghat, Dibrugarh, Tinsukia and Karbi Anglong are likely to experience wind speed of 50 m/s whereas districts like Hailakandi, Karimganj and Cachar have wind speed of more than 55m/s and are more vulnerable to cyclonic storms. Occasional cyclones do occur in western Assam and their severity is more during monsoon.

Recently, on 15-16 April 2022, during Rongali Bihu (Assamese New Year) a severe cyclonic storm hit the state causing 12 reported deaths in Dibrugarh, Goalpara, Barpeta, Baska and Tinsukia districts. As per the report of ASDMA, a total of 21,000 people was affected and 7,344 houses were damaged (partially and fully) in the affected districts.

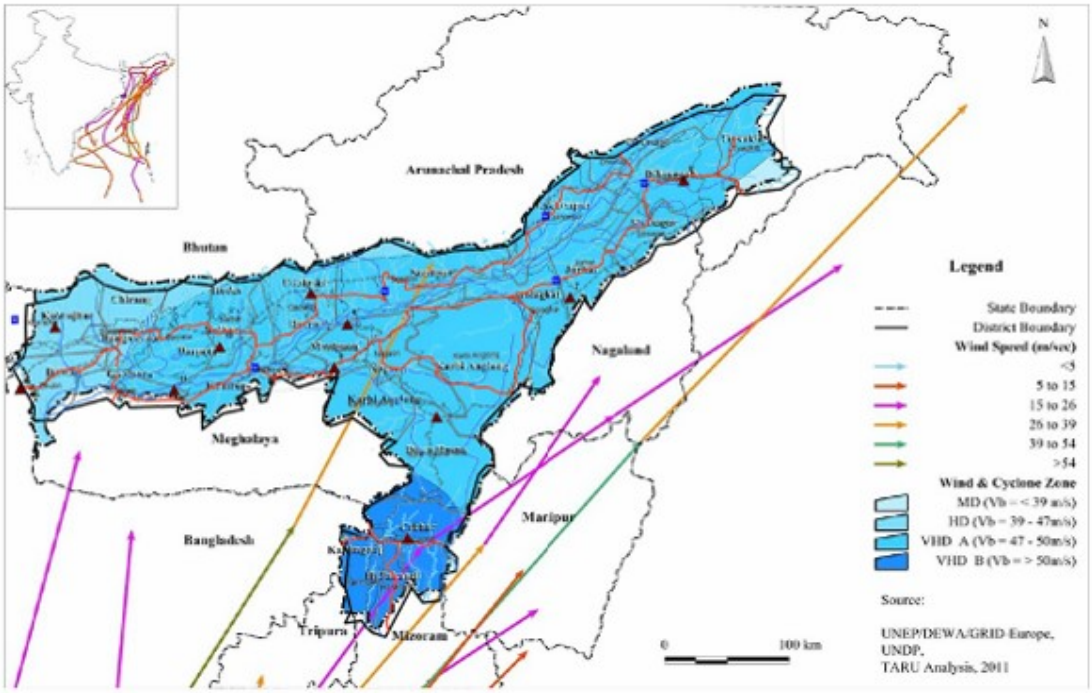


Figure 21: Cyclone Affected Area and Zonation of Assam

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

6.3.6 Drought

Assam suffers periodic droughts due to variability in rainfall pattern over the years. Since 2010, Assam has witnessed drought like situation twice, affecting large number of districts. 14 districts of Assam witnessed drought like situation in 2014, and again in 2019, 20 districts experienced less rain and drought like situation. Warming of the temperature is expected to reduce production of staple crops such as rice, horticulture produce, economically important tea produce, milk yields and fish catch affecting the agriculture productivity and livelihood of people of Assam. There was an estimated crop deficit of around 60 million kilograms, or about 40 per cent, in comparison to that of the same period in 2019. Climate change projections for Assam indicate that mean average

temperature is likely to rise by +1.7-2.2 C by mid-century with respect to 1971-2000. All across the State, except in the southern districts, drought weeks are going to rise as well, by more than 75% with respect to the base line (1971- 2000), which means reduced productivity in the primary sector i.e., agriculture and allied activity thereby impacting life and livelihood of people in Assam.

6.4 Vulnerability and Risk Analysis

As per the available data, in general, one in every five persons living in Assam is highly vulnerable to hazard risks and related emergencies. The percentage literacy is low in the state compared to the national average therefore increasing the complexity of the state administration in communicating hazard risk information to the general public. Sustainability of livelihoods is highly vulnerable especially during or after any disaster events. This issue combined with the presence of less than adequate hospitals and public health centers makes the state vulnerable to health hazards or epidemics which usually follow disasters such as flooding.

The state is frequently affected by the flood hazard i.e., on an average 34% of the land area is affected on decadal basis; followed by erosion, earthquake, landslide, fire and cyclonic storms. The buildings within the state have roof and wall types of categories I and II, these buildings are at high risk to floods, erosion and cyclonic wind storms. The state is also situated in highly earthquake risk prone area (IX and above within MMI scale) placing much of the lifeline infrastructures such as dams, bridges, hydro power projects vulnerable to the hazard. With many hydropower projects taking shape in the state, a detailed assessment of earthquake vulnerability of these infrastructures must be carried out for developing realistic disaster management action plans.

Rapid and unplanned urbanization, population growth, high migration rates and change in land use pattern of the city due to uncontrolled development activities are said to have done a lot of harm to the ecology and environment of the cities across the state. Illegal construction on hills has been one of the major causes for landslides. Uncontrolled urban development, particularly construction activities in and around the city and the city being in high seismic activity zone are the major risk drivers in the city and urban centres of Assam.

The State of Assam is one the most vulnerable states against climate change and vulnerability according to the scientific assessment study - Climate Vulnerability Assessment for the Indian Himalayan Region Using a Common Framework 2018-19.

6.5 Overall Structure

Institutional arrangement across national, state and district levels for disaster management in India is conceived and mandated by Disaster Management Act 2005. However, it must be underlined here that a set of institutional mechanisms was already in place before the national DM Act was enacted. The Disaster Management Act, 2005 puts in place new institutional arrangements at national, state and district level, in addition to the arrangements already in place. This is apparently done in view of the felt need post tsunami disaster in December, 2004, that while the response of the Government and other relevant agencies had been adequate, it could have been considerably improved, if appropriate preparedness and capacity building measures were put in place together with an effective coordination mechanism, and the necessary legislative mandate at national, state and district levels.The basic responsibility for undertaking rescue, relief and rehabilitation measures in the event of natural disasters is that of the State Government concerned. The role of the Central Government is supportive, in terms of physical and financial resources and complementary measures in sectors such as transport, warning and interstate movement of food grains and other relief materials/ resources and other logistic support measure.

At a macro level, the institutional arrangement across all States including Assam is fairly uniform. The State Authority has the responsibility for laying down policies and plans for disaster management in the State. The Chief Secretary, who is the Chairperson of the State Executive Committee which assists the State Authority, is also the ex-officio Member of the State Authority. Besides, the State Government has also established a District Disaster Management Authority (DDMA) for every district in the State.

As per the Disaster Management Act, 2005 and the Assam Disaster Management Rules, 2010, DM arrangements in the state are based on partnerships between National, State, District and Local Authority. This partnership recognizes each level of DM arrangements. DM arrangement in Assam is based on a four tired structure and recognizes all four levels, including the support mechanism from the National Level.

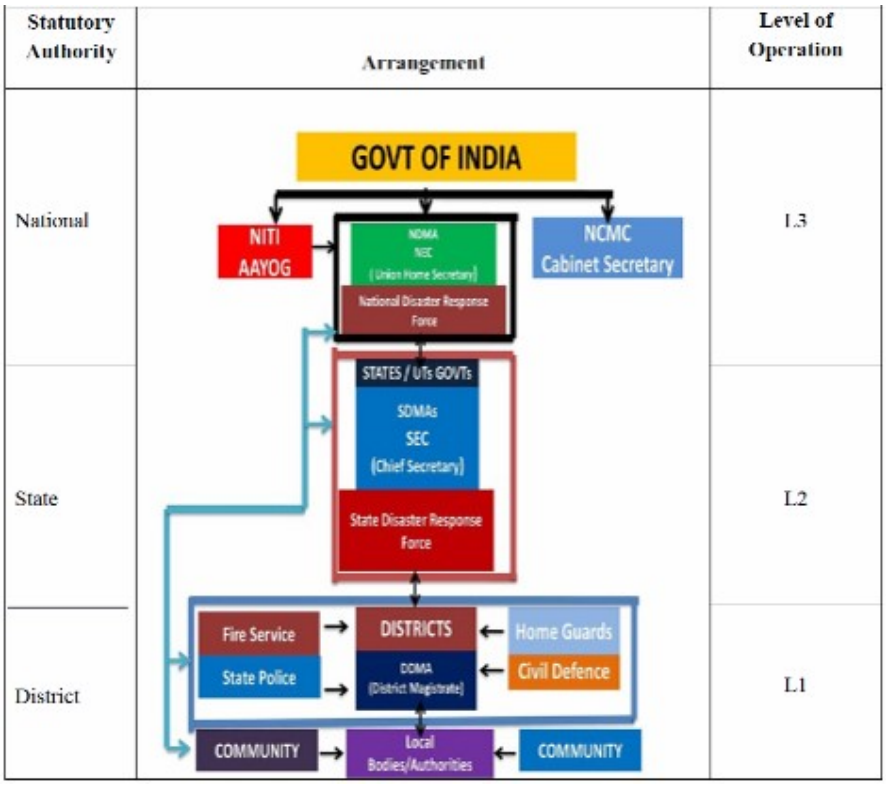


Figure 22: Overall Structure

Source:https://asdma.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_uneecopscloud_com_oid_70/menu/document/assam_state_disaster_management_plan_volume_1.pdf

Overall institutional disaster management structure is already established across the state of Assam (Local/District/State) along with creation of support structures such as Disaster Response Information Centre, State Disaster Response Force (SDRF) among others, so as to conduct operations for each level of DM arrangements.

6.6 Natural Parameters Effects on Transmission Line Towers

This section describes the natural parameters effects on transmission line towers. These are (1) extreme winds cause cyclone, wind gusts, storms; (2) Landslides cause rack falls / siltation and erosion processes; (3) lighting strikes; (4) Floods; (5) drought / forest fire; and (6) Earthquake. The details of these parameters are given below.

1. EXTREME WINDS

Extreme wind gusts are the result of intense turbulence within vigorous storms systems such as ex-tropical cyclones or mid-latitude storms. These systems contain bands of generally strong winds associated with areas of large pressure gradients and these are usually near the centre of low-pressure.

a) CYCLONE

A cyclone is a system of winds rotating counterclockwise in the Northern Hemisphere around a low pressurecentre. The swirling air rises and cools, creating clouds and precipitation. Mid-latitude cyclones are the main cause of winter storms in the middle latitudes.

b) WIND GUSTS

A gust is a sudden increase of the wind's speed that lasts no more than 20 seconds. This usually occurs when wind speeds reach a peak of at least 37.04kph. A wind gust usually comes in 2-minute intervals. A wind gust comes quite suddenly and abruptly. There are a number of different reasons for wind gusts to occur.

c) STORMS

A storm is any distributed state of an environment or in an astronomical body's atmosphere especially affecting it's surface, and strongly implying severe weather.

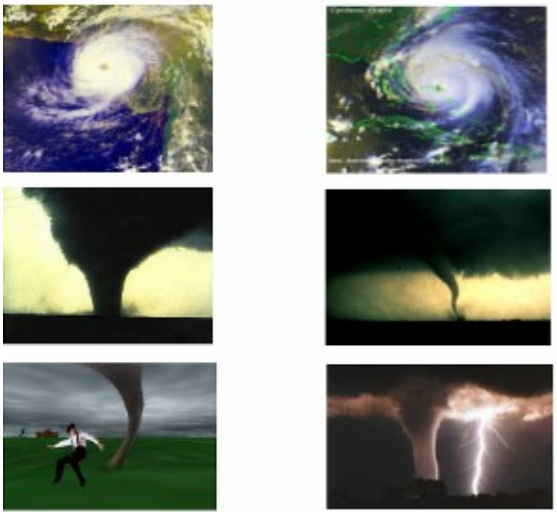


Figure 23: Overall Structure

2. LANDSLIDES

It occurs when masses of rock, earth, or debris move down a slope. Debris flows, also known as mudslides, are a common type of fast-moving landslide that tends to flow in channels. What causes landslides and debris flows. Landslides are caused by disturbances in the natural stability of a slope.

a) ROCK FALLS

A rock fall is a quantity of rock that has fallen freely from a cliff face. The term is also used for collapse of rock from roof or walls of mine or quarry workings.

b) SILTATION AND EROSION PROCESSES

It refers both to the increased concentration of suspended sediments and to the increased accumulation (temporary or permanent) of fine sediments on bottoms where they are undesirable.

Siltation is most often caused by soil erosion or sediment spill. Sediments are material of varying size of mineral and organic origin.

Erosion is the process of carrying away or displacement of sediment by the action of wind, water, gravity. The process of deposition of sediment from a state of suspension or solution in a fluid is called sedimentation.

3. LIGHTNING STRIKES

A lightning strike or lightning bolt is an electric discharge between the atmosphere and the ground.

4. FLOOD

A flood is an overflow of water that submerges land that is usually dry. Floods are the most common natural disaster for all countries.

5. DROUGHT/ FOREST FIRE

Drought is a prolonged dry period in the natural climate cycle that can occur anywhere in the world.

6. EARTHQUAKES

An earthquake is the shaking of the surface of the Earth resulting from a sudden release of energy in the Earth's lithosphere that creates seismic waves.

6.6.1 Mitigation Measures

Mitigation measures related to climate change hazard in electricity transmission system vulnerability and potential impact on power transmission infrastructure is given in **Table 39**.

Table 39: Electricity Transmission System Vulnerability

Climate Change Hazard	Potential Impact on Power Transmission Infrastructure	Infrastructure Vulnerability
Increasing temperatures (air and water) and increasing magnitude and frequency of extreme heat events	• Exposed and sensitive to increasing temperature, leading to a reduction in transmission efficiency and available transmission capacity.	Medium
	• System transmission losses during a heat wave could be significant and contribute to electric power interruptions and power outages	Medium
	• Higher mean and extreme temperatures increased stress and management of electricity on the transmission system due to higher electrical loads.	Low
Changing rainfall patterns, decreasing seasonal water availability and droughts	• Inundation with saline or brackish water can impact transmission towers by contributing to corrosion of tower footings.	Low

Climate Change Hazard	Potential Impact on Power Transmission Infrastructure	Infrastructure Vulnerability
Increasing intensity and frequency of extreme events (storm events, flooding and cyclones) and SLR	• Exposed to sensitive to more frequent and intense extreme events, especially strong wind, floods, river bank erosion, storm events, flooding, and cyclones leading to increased physical damage, disruption transmission lines and decreased transmission capacity.	Medium
	• More frequent and severe lightning storms leading to infrastructure damage and outages.	Low

Annual mean temperature by 2050 in the State of Assam is projected to increase by 2.380C under the A2 scenario. The magnitude of temperature rise increases along with increasing latitude i.e. the northern part of the state is projected to experience a higher temperature rise. Seasonally, January–April period is projected to experience higher temperature rise (>2.50C). The highest temperature rise is projected to occur in March (>2.70C) and the lowest in August (2.00C). (Source: https://www.adb.org/sites/default/files/project-documents//47101-003-pfr-ap09.pdf)

Under the same scenario, annual total precipitation is projected to increase by 126 mm or 5.2%. The increase is projected to occur overwhelmingly (97%) during the April– October season. Spatially, precipitation increase in terms of percentages is projected to be slightly higher for the project areas within Nagaon and Darrang districts (>6%). (Source: https://www.adb.org/sites/default/files/project-documents//47101-003-pfr-ap09.pdf)

6.6.2 Impact and Adaptation Options and Prioritized for Managing the Risks against Climate

a) TEMPERATURE RISE

Impact: Conductors elongate due to the increase in temperature which results in the reduction of ground clearance of transmission lines. This typically intensify the risk of flashovers.

Adaptation: By using higher rated conductorsHTLS, this sagging effect of transmission lines can be reduced. Silicon Conductor may be used.

Conductors made of material that can operate at higher temperatures yet cause lower sag (high temperature low sag or HTLS) may need to be specified at the project design. Strengthening of the towers, tower footings, conductors for extreme heat events, protective coatings to reduce dust deposits on insulators.

But this adoption only suitable for existing line replace by new conductor line to maintain ground clearance without disturbing the towers. However, go with ACSR/AAAC conductor for new proposed lines, it's economical than HTLS.

Underground cables take up less right-of-way than overhead lines, have lower visibility, and are less affected by bad weather. However, costs of insulated cable and excavation are much higher than overhead construction. Underground lines are strictly limited by their thermal capacity, which permits fewer overloads or re-rating than overhead lines. Thus, we can use underground transmission lines in areas where the environmental condition is not suitable for overhead transmission line.

b) HIGH WINDS AND STORMS

Impact: High winds and storms can cause mechanical damage to overhead lines, towers, poles and substations directly and by blowing debris against exposed grid system components indirectly. In transmission lines, high winds may lead to flashovers caused by live cables galloping and thus touching or getting too close to each other. Strong winds can blow trees over overhead lines and short circuit lower lying distribution grid system cables.

6.6.3 Conductor Vibrations

Vibration in Power Lines can be categorized into three types:

1. Aeolian vibration
2. Gallop
3. Simple swinging

Aeolian vibration- These vibrations are caused by aerodynamic forces generated as the wind blows across the conductor. The frequency of the vibration may receive positive feedback from the conductor's natural vibration frequency.

Gallop- These vibrations are low frequency and high amplitudes. These vibrations are caused by wind blowing over conductors which are not circular. Hence, conductors are designed to be circular to prevent gallop-type vibrations.

Simple swinging- This kind of vibration occurs in the horizontal direction as the conductors swing under the influence of wind. This kind of swinging does not have any major impact. However, it needs to be ensured that the lines do not come too close to each other or the tower to cause a flash over.

Adaptation: Designing transmission towers and substation structures to withstand the highest projected wind loadings, more frequently inspecting and maintaining their integrity, rerouting lines alongside roads or across open fields, more frequently and drastically trimming trees, and more effectively forecasting storms and hurricanes are examples of a wide range of already established adaptation options that may need to be increasingly used in the future.

As per latest Indian standard IS802-2015 (part1/sec1) the following changes will resolve tower failure from old code design. Such as:

1. Drag co-efficient for evaluating wind load on towers have been stipulated for different sections & The change in Drag Co-efficient for different solidity ratios
2. Load combination for sag tension of conductor and ground wire / optical ground wire (OPGW) and for climate loads have been modified.
3. Narrow Front wind to be considered for Suspension tower.
4. For suspension tower, the loading condition also updated as 75% EDT wind to consider for wire loading calculation.
5. In Addition, the Wire loading also included additional load cases with angle of wind direction in 0,30,45 Deg.
6. Material requirement for bolts and nuts have been modified.
7. Tower should be tested as per provisions of relevant Indian standard and observed until the specified waiting period is over.
   However, the above changes will affect the design margin and objectives is to optimization in Tower design.

c) THUNDER & LIGHTNING RISK

Impact : Thunder and lightning can cause transmission lines to trip and become temporarily unavailable for operation. The extremely high voltages of a lightning impulse can result in short circuits which can lead to permanent damage of conductors, insulators, and the structures.

Lightning risk to distribution lines situated at lower elevations is smaller but not negligible. Lightning close to or directly on-line conductors produces ionized gases that can cause a short circuit fault as the electrical protection disconnects the affected circuit. Such flashover faults may increase in many regions owing to greater lightning frequency.

Adaptation: Vulnerability can be reduced by adding earth wires above live conductors and to substations, and fitting spark gaps and surge arresters. These are widely used techniques, but more will be needed in the affected regions in the future.

A lightning arrester is placed where wires enter a structure, preventing damage to transmission lines within and ensuring the safety of individuals near them. Lightning arresters, also called surge protectors, are devices that are connected between each electrical conductor in a power system, and the Earth. They prevent the flow of the normal power or signal currents to ground, but provide a path over which high-voltage lightning current flows, by passing the connected equipment. Their purpose is to limit the rise in voltage when a communications or power line is struck by lightning or is near to a lightning strike.

d) HIGH TEMPERATURES

Impact: Losses in transmission efficiency due to gradual warming are relatively small compared with the physical and monetary damage to power transmission networks that can be caused by hot weather conditions. Transmission losses increase far beyond the level caused by the higher average temperatures: expanding cables might trigger flashover to trees underneath, and extreme high temperatures can make lines and transformers overheat and trip off.

Adaptation can include a mix of measures, like enhancing system capacity, increasing the tension in the line to reduce sag and adding external coolers to transformer.

e) FLOODING

Impact: Flooding caused by heavy rains and storm, Rerouting lines across less exposed regions is another option to consider increasing heavy rain may cause flashover faults across high voltage insulators and short circuits in high voltage circuit breakers.

The intensity of the flash flood was severe enough to wash away the foundations of the collapsed tower.

Adaptation: Rerouting of line will increase line length and pile foundation cannot be avoided in the alternate route.

The improved design of insulators, careful siting and enhanced maintenance can mitigate vulnerability to these impacts. surges would damage equipment at ground level (substations and transformers). Improving insulator design, siting ground installations outside hazard zones and reinforcing supporting elements can help reduce these impacts.

Pile type foundations may be considered for towers in flood prone areas based on soil investigation reports and latest high flood data.
By Providing Proper Revetment and use of geo-synthetic material in foundation, concrete encasing and painting of stub in water logging areas etc, may also be considered, wherever required.

Coping of chimneys of tower foundation, wherever required, should be taken up to avoid rusting of stubs.

The power transmission design of individual components has changed but the materials of construction remained virtually the same. Thus, by using steel and cast iron (bare, painted or galvanized), aluminum alloys and copper alloys. To enhance the corrosion resistance of these materials various treatments, coatings and inhibitors are applied which enhance the life of the transmission lines.

f) DROUGHT

Impact: Drought conditions are particularly dangerous when vegetation close to overhead lines dries out. The dry undergrowth can be ignited by flashover if it comes into contact with line conductors. Ionized air in the resulting smoke and combustion particles may turn into an electricity conductor that would cause multiple luminous electrical discharges (arcs) on the overhead line. Forest or bush fire caused by drought can also damage overhead lines directly by damaging conductors and insulators and by burning wood poles.

Adaptation: Trimming back vegetation to a safe distance within and along the borders of transmissioncorridors is the most obvious way to reduce vulnerability to this type of weather hazard. Depending on regional circumstances, routing transmission lines to areas without high growing flora may also need to be considered.

g) LANDSLIDES

Impact: The failure of towers might have been caused by the landslides triggered by continuous rain for few weeks. The landslide might have caused the complete sliding away of the supporting soil which might have caused the deformation in tower.

Adaptation: To explore the possibility of Proper Drainage and protection work / retaining wall for foundation of towers in hilly terrain to avoid such incidences in future.

h) EARTHQUAKES

The behaviour of steel transmission tower at the action of seismic load and wind load is studied by conducting large deformation and elasto-plastic analysis.

For the analysis, the wind load with a design wind velocity considered as 40m/s was considered and the earthquake parameters taken form Kobe earthquake,1995 was considered.

Based on the analysis, it is reported that the maximum displacement of the tower in seismic analysis and there was no buckling in the main leg members while compared to that of the wind response analysis. Hence from the results it has been suggested that earthquake resistance is larger than that of the wind resistance for the targeted tower.

Analysed the behaviour of transmission line towers through the non-linear time history analysis of transmission towers on sloped ground has been carried out for different height, bracing system and

also with the provision of base isolators using SAP2000(software).

From this analysis report it has been found out that the ability of tower to withstand the earthquake forces could be increased with the provision of non-linear rubber isolator and the provision of eccentric bracing system has greater effect than other two X & V bracings.

However, concluded that this kind of transmission tower would be **safer** even in severe earthquake (zone 5) which satisfies both serviceability and collapse criteria.

Only earthquake factor should consider in Tower loading for foundation design.

6.7 Conclusion

The major causes of failure of towers are as under: The high wind velocity during storm, cyclone and local phenomenon of whirlwind and windstorm etc. might have exceeded the wind speed for which the tower is designed. This type of wind is difficult to predict. **The probability of such occurrences is low & the tower design will be uneconomical if such situation is considered in the design.**

By analysing the prevention methods of transmission line. It can be concluded that the need of protective system is an important part of power system. Transmission line protection method from fault mentioned in the paper can be achieved by adopting the methods mentioned. Electrical powerplays a very important role in the country's economy and hence the need for prevention of transmission line increases many more times than that of any other type of energy. A case study of tower failure and its remedies is given in **Appendix 8**.

Chapter 7: Framework Procedures for Environmental & Social Management

This chapter encompasses a comprehensive overview of the screening process, capacity enhancement initiatives, institutional arrangements, Environmental and Social Management Plan (ESMP), Environmental and Social Monitoring Plan (ESMoP), and the corresponding implementation budget. It further delineates the requisite procedures and tools essential for the screening and evaluation of environmental and social impacts. The assessments of environmental and social impacts are mandated to adhere to the stipulations outlined in both national and state laws, as well as the pertinent Environmental and Social Standards/Policies established by AIIB. The Environment and Social Management Framework Procedure delineates specific measures designed to mitigate negative risks and impacts while augmenting positive outcomes. In addition, organisational capacity and training requirements, required to check and ensure effectiveness of the plan throughout the lifecycle of the project, have also been discussed.

7.1 Environmental & Social Management Procedures

The overall environmental and social management procedure is shown in the **Figure 24:** Environmental and Social Management Procedure. After a sub-project (sub-station and associated transmission lines) has been developed with outline design and location/alignment options, screening of environmental and social risks can be done. This will help in the preparation of E&S instruments i.e.; ESIA and ESMP. The recommendations from these E&S documents need to be incorporated by the detailed design team and also incorporated into the tender (bidding) documents. After selection of the EPC (s), site preparation activities will commence and at the same time ESMP implementation will begin. This will involve carrying out the proposed mitigation measures, monitoring and reporting activities for the sub-projects.

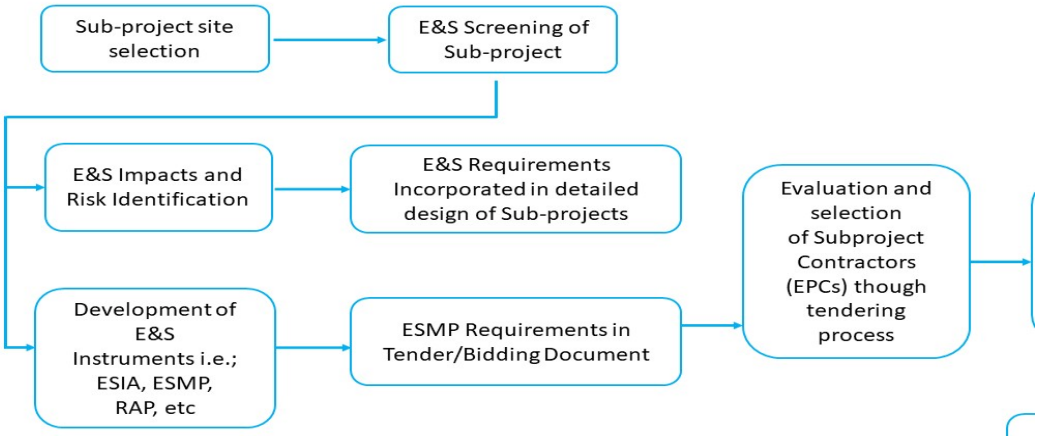


Figure 24: Environmental and Social Management Procedure

7.2 Sub project Screening and Categorization

The screening and categorization of Project are important to determine the nature and level of theenvironmental and social review, type of information disclosure and stakeholder engagement require for the project. This step would involve review of the available environmental information about the sub-project and its surrounding Area of Impact (AoI). The extent of AoI may vary from sub-project to sub-project depending on its siting, magnitude, components of Sub-Projects and local

geographical condition. Extent of AoI should be established with proper justification at the time of scoping process and also must be determined with the advice of environmental specialists engaged for Environmental and Social Impact Assessment.

All sub-projects or project components to be implemented under phase II of the AISTSE project will be subject to an environmental/social screening in order to prevent execution of projects with significant negative E&S impacts. The purpose of "environmental/social screening" is to get a preliminary idea about the degree and extent potential environmental impacts of a particular sub-project, which would subsequently be used to assess the need for further environmental/social assessment.

7.2.1 Environmental Screening

Environmental Screening would help to identify key environmental concerns during site visits and also provide a preliminary idea regarding the nature, extent, and phasing of environmental issues that would need to be handled during the subsequent stages of project cycle. It will also help to identify opportunities for avoidance and/or minimization at early stage of the project cycle so that the change in design process is possible. The following describes the steps to be followed during the screening:

- Confirm the presence of environmentally and ecologically sensitive areas from secondary sources and site observations
- Verify the extent of applicability of legislation of GoI and GoA and Policies of AIIB in sub-project activities
- Identify potential negative or positive, direct or indirect impacts and provide clarity on issue, which needs to be investigated more comprehensively during process of ESIA at later stage
- Incorporate feedbacks of public consultation and answer to published notice
- Categorize the project in order to determine whether it requires ESIA
- This should help with sequencing of sub-projects and factoring in timelines like those associated with regulatory clearance processes (if any).

The results of the screening will help:

- To determine applicability of regulatory and policy and requirement ofclearances/ permissions
- Identification of key environmental concerns
- Scoping for ESIA

7.2.2 Social Screening

The purpose of conducting Social Screening at Sub-Project Level is to get an overview of the nature, scale and magnitude of the social issues in order to determine the need for conducting social impact assessment and preparing RPs/Abbreviated Resettlement Plan (ARPs), IPPs (if applicable). After identifying issues, the applicability of the Bank's ESS 2 and ESS 3 should be established along with GoI and GoA regulatory requirements.

The Social Screening should be carried out in close consultation with various stakeholders like project beneficiaries, Potential PAFs/PAPs, Women Group, Indigenous community, Economically Backward Communities, other local key informants, Vulnerable Groups, institutional stakeholders like various Govt. Departments, Non-Government Organizations (NGOs) etc. as applicable.

Social screening provides first stage information about the subproject on: (i) Potential PAP population; (ii) extent of land required and potential impact on other assets; (iii) impacts on poor

and vulnerable groups (iv) potential needs for permanent/temporary livelihood restoration; and (v) any other possible social impacts.

The outcome of the Social Screening process will also help to prioritize the sub project and where required, start the social mitigation process in a timely manner. This will also assist in sequencing of Sub-Projects in overall project implementation.

7.3 Scoping for Assessment Activities

Based on the screening exercise, the scoping for E&S study will be done. The main objective of thescopingstudy is:

- To get familiarized with the sub-project details
- To define the study area comprising the project sites and its ZoI
- Outline the E&S interactions pertaining to the project, on which the ESIA study shall be focusing on
- Define the scope of work and the approach and methodology towards conducting the ESIA/ESMP,
- RP or ARP

Scoping should be done to ascertain the determination of environmental and social issues associated with theSub-Project, extent of Area of Impact (AoI), PAP, adequate mitigation approach etc. and the aspects particularly on which ESIAstudy should emphasis on. For this purpose, the project documents and design related information should bereviewed; site survey should be undertaken to understand the E&S sensitivities prevailing in the project areaand its AoI. The secondary information on the project area and on similar project should also be studied. Basedon the study, likely E&S issues associated with the Project activities during preconstruction, construction andoperation should be determined.

7.4 Approach to Categorization of the Sub-projects

Environmental and social risk screening and classification of sub-projects take into account relevant potential risks and impacts, such as:

a. the type, location, sensitivity and scale of the sub-project;
b. the nature and magnitude of the potential E&S risks and impacts, including impacts on greenfield sites; impacts on brownfield sites including (e.g., rehabilitation, maintenance or upgrading activities); the nature of the potential risks and impacts (e.g. whether they are irreversible, unprecedented or complex); resettlement activities; presence of Indigenous Peoples; and possible mitigation measures considering the mitigation hierarchy;
c. the capacity and commitment of the Borrower (AEGCL) to manage such risks and impacts in a manner consistent with the AIIB's ESSs, including the country's policy, legal and institutional framework; laws, regulations, rules and procedures applicable to the Project sector, including regional and local requirements; the technical and institutional capacity of the Borrower; the Borrower's track record of past Project implementation; and the financial and human resources available for management of the Project;
d. other areas of risk that may be relevant to the delivery of ES mitigation measures and outcomes, depending on the specific Project and the context in which it is being developed, including the nature of the mitigation and technology being proposed, considerations relating to domestic and/or regional stability, conflict or security.

AIIB determines the Project's category by the category of the Project's component presenting the highest environmental or social risk, including direct, indirect, cumulative and induced impacts, as relevant, in the Project area of influence. The Bank assigns each proposed Project to one out of the four designated Categories i.e. Category A, Category B, Category C and Category FI.

- **Category A (High Risk):** A Projects is categorized A if it is likely to have significant adverse environmental and social impacts that are irreversible, cumulative, diverse or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works and may be temporary or permanent in nature.
- **Category B (Substantial Risk):** A Project is categorized B when: it has a limited number of potentially adverse environmental and social impacts; the impacts are not unprecedented; few if any of them are irreversible or cumulative; they are limited to the Project area; and can be successfully managed using good practice in an operational setting.
- **Category C (Moderate Risk):** A Project is categorized C when it is likely to have minimal or no adverse environmental and social impacts.
- **Category FI (Low Risk):** A Project is categorized FI if the financing structure involves the provision of funds to or through a financial intermediary (FI) for the Project, whereby the Bank delegates to the FI the decision-making on the use of the Bank funds, including the selection, appraisal, approval and monitoring of Bank-financed subprojects.

Subsequently, it is required to carry out environmental and social assessment (ESIA) which is significantly consistent with the objective to manage potential environmental and social impacts commensurate to the scale and nature of the sub-project according to the AIIB's E&S standards and policies.

The project will have overall positive impacts by providing and improving power supply to the households. It will certainly meet the ever-increasing demand of power in the state of Assam that will bridge the gap betweendemand andsupply. However, there will be some adverse potential environmental & social impacts due to sub-projectactivities during construction and project operation phases. During the construction phase, the impacts maybe regarded as temporary or short-term.

7.5 E&S Considerations in Sub-project Design and Analysis of Alternatives

Environmental and social issues will be mainstreamed into the subproject design through a detailed analysis of alternatives to the subproject location and design of subprojects. The primary objective of the "analysis of alternatives" is to identify the design, location, material, technology etc. for a particular sub-project that would generate the least adverse impact, and maximize the positive impacts.

The criteria to be considered in evaluating various alternatives will be based on the following aspects:

- Technical Aspects: Robustness (alternative design and technology), constructability (alternative location of substation and transmission line alignment) and maintenance requirements.
- Financial Aspects: Construction cost and maintenance cost
- Environmental Aspects: project footprints, impacts on terrestrial and aquatic ecology, and
- Social Aspects: Land acquisition, Restrictions on Land Use, Resettlement, nuisance, and socioeconomic impacts.

Among the above-mentioned criteria, the most significant criteria in power transmission project is alternative assessment of Transmission Line alignment and substation siting. For Transmission Lines, multiple alternate route options as proposed by design/engineering team should be thoroughly examined by ESIA study team towards documenting E&S sensitive features located along the corridor of e ach of the alignment options. Based on the assessment and keeping in place required design and financial feasibility considerations, most suitable option where E&S conflict is less, should be recommended for final consideration.

The alternative analysis conducted by AEGCL to shortlist the most feasible transmission line route needs to include the parameter of social assessment, along with environmental. The process of understanding and calculating the compensation for temporary damages may be carried with the alternative analysis.

The process is given below:

- A Social Assessment is conducted in respect of each of the chosen lines of alignment. The process involved extensive consultations with land owners/farmers and different stakeholders.
- During the process public views and necessary inputs about surroundings/ villages/crops etc. are also necessary and noted for screening/scoping. After comparison and analysis of the environmental and social parameters gathered for all alternatives, and considering other significant economic benefit associated with the project/subproject, the most optimum route having the minimum environment & social impact is selected for further investigation.
- Site office will consult with state forest departments if the line is passing through forest areas. Revenue authorities will be consulted for their views on revenue/other lands. Experts' assistance will be taken, as appropriate, on valuing crops, trees and other assets.
- Social Assessment concludes with: (i) selection of an optimum line; and (ii) a Social Management Plan viz., assessment of temporary damages and compensation. All these are disclosed widely among the stakeholders as well as on the internet and evince feedback. Due approval will be sought from District/ Village Councils. In case the scheme/project is implemented in predominantly tribal area a separate and comprehensive analysis in respect of likely impact both positive and negative shall be carried out and will be incorporated in the entitlement matrix or under a whole Indigenous development plan.
- In cases of areas under the District Council/ Village Council in tribal areas, where official land records don't exist, formal land/property boundaries of private property owned by the tribal households can be determined through the process of community consultation and discussion with village head and village council members. Based on such information, land can be classified, and land record can be updated, and compensation assessment can be made.
- In the states where the district council is under operation, although the land is notified from the district collector's/ deputy commissioner's office, the verification of ownership is done by the district/village council in consultation with the village people and assessment of compensation also done by the revenue officials based in the district council. After determination of ownership and compensation amount the same is sent to the district collector/ deputy commissioner.
- A notice under Indian Telegraph Act/Electricity Act, 2003 is served to the landowners informing that the proposed transmission line is being routed through the property of the individual concerned. The notice shall contain the particulars of the land, ownership details and the details of the trees/crops inevitability likely to be damaged during the course of the construction of the proposed transmission line and acknowledgement received from land owner.
- The revenue officer shall further issue a notice of intimation to the concerned landowner and inspect the site to verify the documents related to the proof of ownership and a detailed

Mouja list is prepared for the identified trees and crops inevitability damaged during the course of the construction. For assessing the true value of timber yielding trees help of forest officials is taken and for fruit bearing trees help of Horticulture department is taken.

- The Mouja list shall contain the land owner details type of tree/crop, its present age, variety, yielding pattern etc. and the same is prepared at site in the presence of the land owner. These Mouja lists are further compiled and a random verification is conducted by the concerned District Collector or his authorized representative in order to ascertain the assessment carried out by the revenue office is genuine and correct. After this process the district collector issues a tree cutting permit to AEGCL to enable removal / damage to the standing tree/crop identified in the line corridor.
- Once the tree/crop is removed / damaged, AEGCL shall issue a tree cutting/crop damaged notice to the land owner with a copy to the Revenue Officer to process the compensation payment. The detailed Valuation statement is verified at various levels and approval of payment of compensation is accorded by the concerned District Collectors.
- On approval of compensation, the revenue officer shall further intimate the amount payable to the different landowners and AEGCL arranges the payment by way of Demand Draft to the affected parties.

7.6 Establishment of Baseline Conditions

The project will assess and delineate the influence area for each subproject, encompassing regions expected to experience direct or indirect effects from the construction and operation of the subproject and its associated facilities. This analysis will extend to areas susceptible to impacts arising from unplanned yet foreseeable developments triggered by the subproject, as well as regions affected by cumulative impacts resulting from the conjunction of the subproject with other activities within its designated area of influence (AoI).

The baseline environmental data for the project's influence area, encompassing physical, ecological, biological, and socio-economic aspects, will be gathered through a comprehensive examination of bothprimary data collection and secondary literature. The primary data collection process will specifically focus on assessing wildlife habitats, ecological conditions, ambient air and noise quality, as well as the quality of surface water and groundwater. Additionally, primary surveys will be conducted to establish a baseline understanding of the socio-economic conditions within the communities situated in the project area.

7.7 Environmental and Social Impact Assessment (ESIA)

Detailed characterization and assessment of these impacts will be carried out in the respective subproject-specific ESIA/ESMP prior to invitation of bids. In addition, the impacts of the proposed subprojects on the environmental and social components will be identified through field visits, and consultation with experts and the local community. The impacts will be qualitatively analysed and graded (e.g., high, substantial, moderate, low) to pinpoint significant effects. The mitigation hierarchy will serve as a guide during impact assessment, ensuring a thorough analysis of alternatives. Anticipated impacts will be forecasted based on the professional judgment of the interdisciplinary team, drawing from collected baseline information and, if necessary, modelling studies. The impact assessment will encompass both cumulative and induced impacts arising from the subprojects. A sample format for the same is provided in **Appendix 9**.

7.8 Environmental and Social Management Plan (ESMP)

An Environmental and Social Management Plan (ESMP) serves as a pivotal document dedicated to translating identified potential impacts into tangible mitigation measures. Its primary objective is to

initiate the practical application of avoidance and minimization strategies from the design and pre-construction phases, guiding the reduction of project impacts to an acceptable level during sub-project implementation. The ESMP, being sub-project specific, meticulously outlines adverse impacts, specifies management measures chosen to mitigate them to an acceptable level, and establishes clear timelines for the implementation of these measures. In essence, the ESMP stands as a comprehensive document, ensuring that every conceivable effort has been exerted to address and alleviate environmental and social concerns associated with the sub-project. It should also clarify roles and responsibilities of various entities. AEGCL, PMC, Contractors, other stakeholders etc. The key components of an ESMP are:

- Mitigation measures to be adopted for every possible potential adverse impact during Design, Preconstruction, Construction/Implementation and Operation phases as identified through ESIA.
- Enhancement plans for positive impacts.
- Monitoring Plan with indicators (physical, biological and social), mechanisms, frequency, locationsetc.
- Institutional arrangements for each activity and mitigation measures.
- Implementation schedules for each activity.
- Budgetary allocations for implementation of mitigation measures.
- Reporting procedures, including for redressing grievances related to environmental issues.

The cost for implementation of the management measures, the institutional arrangements for monitoring shallbe included in the estimated project cost. The site-specific mitigation measures should be designed by contractor. A format of the ESMP is given in **Appendix 10**.

7.9 Environmental and Social Monitoring Plan (ESMoP)

To ensure the successful implementation of Environmental and Social Management Plans (ESMP), it is crucial to actively collect real-time environmental and social data and conduct thorough assessments. To ascertain the efficacy of mitigation measures and adherence to environmental and social standards, an Environmental and Social Monitoring Plan (ESMoP) will be developed. A format of the ESMoP is given in **Appendix 11**.

7.10 Traffic Management Plan (TMP)

A comprehensive traffic management plan is essential for ensuring the safe and efficient movement of vehicles during construction activities involving carting earth filling material. The plan should begin with a detailed assessment of the site layout, taking into account factors such as access points, road conditions, and potential hazards. Clear signage and designated traffic routes should be established to guide vehicles safely through the site, minimizing the risk of dust emissions, accidents or congestion. Additionally, scheduling deliveries and carting activities during off-peak hours can help reduce traffic congestion and minimize disruption to neighbouring areas. Regular communication and coordination among construction personnel, drivers, and site managers are crucial for implementing the traffic management plan effectively and ensuring that all safety protocols are followed diligently. Regular monitoring and adjustments to the plan may be necessary to address any unforeseen challenges or changes in site conditions. By prioritizing safety and efficiency, a well-executed traffic management plan can contribute to the successful completion of construction projects while minimizing risks to workers and the public. A format of the Traffic Management Plan is provided in **Appendix 12**.

7.11 Labour-Camp Management Plan (LCMP)

A labourmanagement plan is a strategic document that outlines the systematic approach and guidelines for effectively managing the labour workforce within an organization. This comprehensive plan typically includes elements such as workforce planning, recruitment and hiring procedures, training and development initiatives, performance evaluation criteria, and strategies for employee retention. Additionally, it addresses issues related to employee engagement, satisfaction, and well-being, fostering a positive work environment. By implementing a well-defined labourmanagement plan, organizations can enhance productivity, optimize resource utilization, and create a supportive culture that nurtures the professional growth of their employees.

It is envisaged that during construction phase, labourers for various jobs such as civil, mechanical and electrical works will be hired through authorized manpower agencies. It is anticipated that the peak labour requirement during construction phase of the project will be approx. 50 persons involving unskilled, semi-skilled and skilled labourers. Unskilled labourers are likely to be recruited from local villages, while semi-skilled and skilled labourers (approx. 10 to 15) may come from outside area. For labourer, who will spend the night onsite, accommodation will be provided.

The influx of construction labourer will have both negative and positive impacts on the nearby community and local environment. The labourer will be accommodated in temporary campsite within the project boundary, which can have significant interface with the nearby communities. This might also put pressure on the local resources such as roads, fuel wood, water etc.

The plan should encompass various facets including accommodation facilities, health and safety protocols, hygiene standards, recreational activities, and transportation arrangements. Accommodation should be designed to provide comfortable living conditions, with adequate space, ventilation, and amenities such as clean water and sanitation facilities. Health and safety protocols must be rigorously enforced to prevent accidents and mitigate risks, encompassing regular inspections, safety training, and emergency response procedures. Hygiene standards should be maintained at high levels to safeguard against the spread of diseases, with regular cleaning schedules and provisions for personal hygiene products. Additionally, providing recreational facilities and organizing leisure activities can contribute to workers' morale and well-being. Transportation arrangements should ensure timely and safe commuting for workers between the labour camp and the construction site, minimizing any potential disruptions to workflow. Through meticulous planning and implementation of these measures, the management plan can foster a conducive environment for workers, promoting efficiency, satisfaction, and ultimately, the successful completion of the construction project.

In view of the above, the construction Contractor shall also develop a site-specific Health & Safety Management Plan (HSMP) in consistent with all applicable health and safety regulations. The same shall be submitted to AEGCL for approval with progress on the implementation of the plan to be shared with AEGCL on a monthly basis. A format of the LCMP is given in **Appendix 13**.

7.12 Borrow Area Management Plan (BAMP)

A Borrow Area Management Plan is a crucial document for construction projects involving excavation or earthwork activities. This plan outlines strategies for the responsible and sustainable management of borrow areas, where materials such as soil, sand, or gravel are sourced for use in construction. It begins with a thorough assessment of the borrow area's environmental characteristics, including soil composition, vegetation, and wildlife habitats. The plan then delineates specific measures to minimize environmental impact, such as erosion control techniques, revegetation plans, and measures to protect nearby water bodies from sedimentation. Additionally, the plan may include

provisions for monitoring and regular inspection of the borrow area to ensure compliance with environmental regulations and project requirements. By integrating environmental stewardship principles with practical construction needs, a well-developed Borrow Area Management Plan can facilitate the responsible extraction of materials while preserving natural resources and minimizing ecological disruption. A format of the BAMP is given in **Appendix 14**.

7.13 Occupational Health and Safety Management Plan (OHSP)

An Occupational Health and Safety (OHS) Management Plan is a comprehensive document designed to ensure the health, safety, and well-being of workers involved in the construction sites. This plan begins with a thorough assessment of potential hazards and risks associated with the project, including health issues related to the workers working adjacent to live high voltage equipment, working adjacent to and in the vicinity of, live high voltage overhead lines, working at elevation, lifting operations, use of explosives, use of heavy machinery including crane age, pile rigs and concrete mixers, excavation works, work in confined spaces, working with insulating oil, working with compressed gas, rotating machinery etc. An OHS plan outlines clear protocols and procedures for identifying, reporting, and mitigating hazards, as well as providing adequate training and personal protective equipment for workers. Additionally, the plan includes provisions for regular safety inspections, emergency response protocols, and communication channels to promote a culture of safety and accountability among all personnel. By prioritizing the prevention of accidents and injuries, as well as compliance with relevant health and safety regulations, an Occupational Health and Safety Management Plan plays a vital role in ensuring the successful and safe completion of construction projects. A format of the OHSP is given in **Appendix 15**.

7.14 Emergency Action Plan (EAP)

An Emergency Action Plan (EAP) for a power project is a crucial document outlining procedures and protocols to respond effectively to emergencies and mitigate potential hazards. The plan identifies potential emergencies such as electrical failures, fires, or equipment malfunctions that could occur during the construction and operation phase of the project. It establishes clear roles and responsibilities for personnel, designates evacuation routes, and specifies procedures for alerting and coordinating emergency response teams. Additionally, the plan includes provisions for communication with external emergency services, establishing assembly points for personnel, and conducting regular drills and training exercises to ensure readiness. By prioritizing preparedness and response capabilities, an Emergency Action Plan enhances safety measures and minimizes the impact of emergencies on power sub-station and transmission line projects, safeguarding both personnel and infrastructure. A format of the EAP is given in **Appendix 16**.

7.15 Gender Action Plan (GAP)

A Gender Action Plan (GAP) is a strategic document or initiative developed to promote gender equality and address gender-related issues. The purpose of a Gender Action Plan is to identify, prioritize, and implement actions that contribute to advancing gender equality and empowering individuals of all genders.Developing a comprehensive Gender Action Plan (GAP) is crucial for ensuring the integration of gender perspectives and promoting inclusivity within our project.

A strategic Gender Action Plan (GAP) given in **Appendix 17** provides a detailed mapping of potential positive and negative impacts on women workers. The following measures are suggested during project implementation to improve gender equality:

- Prioritize temporary employment of women in the project construction work, in keeping with the required skill set;

- Ensure equal pay for equal work for women and men workers;
- Provide basic amenities (such as separate toilets for male and female workers, clean water, drinking water facilities, resting place etc.) for male and female workforce at construction site and labour camp;
- Implement provisions of the Sexual Harassment of Women at Workplace Act, 2013;
- Address gender-based violence risk through (i) community engagement throughout project lifecycle, (ii) labour management plan, and (iii) grievance redressal mechanism.

Gender Monitoring Indicators

Following indicators would be used to adequately monitor gender action plan:

- Number of women employed as a percentage of total persons employed in construction activities;
- Number of women workers earning same wage as men workers, as a percentage of total women workers employed in construction activities;
- Availability of basic amenities and separate toilet at campsite; and
- Constitution of "Internal Compliant Committee" in JUNSL to register sexual harassment case.

7.16 Citizen Engagement Action Plan (CEAP)

Developing a Citizen Engagement Action Plan (CEAP) is crucial to ensure transparency, inclusivity, and the active involvement of the community. The plan should begin with a comprehensive stakeholder analysis to identify and understand the diverse interests and concerns of the local population. Building on this, the next step involves creating targeted communication strategies to disseminate project information in a clear and accessible manner, utilizing various channels such as community meetings, newsletters, and online platforms. Additionally, establishing feedback mechanisms, like suggestion boxes or public forums, allows for continuous dialogue, enabling the project team to address community questions and concerns promptly. Moreover, incorporating local perspectives into decision-making processes and considering community preferences wherever feasible can enhance the overall project acceptance. Regular updates and progress reports should be shared with the public to maintain trust and keep the community informed about the project's development. A well-crafted Citizen Engagement Action Plan not only fosters positive relationships but also contributes to the long-term success and sustainability of the power project.

7.17 Stakeholder Consultations and Disclosure

Engaging stakeholders through consultations stands as a crucial element within the Environmental and Social Impact Assessment (ESIA) process. It is imperative to conduct consultations with both institutional stakeholders and local communities. This practice serves to uncover potential opportunities and risks, enhance the design and execution of sub-projects, and foster a sense of ownership and sustainability. Prior to engaging in stakeholder consultations, a thorough stakeholder analysis should be conducted to identify pertinent individuals or groups related to the proposed subproject intervention.

Stakeholder consultations will occur in two distinct phases. The initial stage of consultations will coincide with the reconnaissance survey screening phase and will be followed by the acquisition of baseline data for the ESIAstudy. Subsequently, the second stage of consultations will take place following the preparation of a draft ESIA/ESMP. This stage aims to communicate the findings of the Environmental and Social study and gather feedback from stakeholders.To ensure transparency and wider participation, copies of the draft ESIA/ESMP will be made available on the AEGCL website, AEGCL's Project Management Unit (PMU), and Divisional Offices. Additionally, they will be

disseminated at the local Panchayat and block levels, among other relevant platforms, for a minimum duration of 30 days. This period will allow the public to provide recommendations and express concerns for further consideration.

The evaluation of stakeholder consultation initiatives will gauge their efficacy and suitability, as needed, to assess the success of meetings and the overall stakeholder engagement process. The assessment criteria will be customized to suit the specific audience, focusing on perceptions of the meetings and the process itself as unbiased, unobstructed, and devoid of coercion or intimidation. Emphasis will be placed on ensuring that information is provided in a timely, pertinent, understandable, and accessible manner, presented in a culturally appropriate format.

7.18 Preparation of ESIA/ESMP and RP

Environmental and Social Impact Assessment (ESIA) serves as a fundamental tool in ensuring that environmental and social considerations play a pivotal role in decision-making processes. Its influence extends to shaping designs to proactively minimize or avoid adverse impacts, while also facilitating the mitigation of unavoidable negative effects and enhancing positive ones. Additionally, ESIA creates a platform for gathering input from stakeholders, including the directly affected community and institutions, with the aim of refining the design to enhance the overall quality of the asset. Also, a generic ESMP considering the site visit findings has been described under section 5.5, which will serveas a contractual obligation toward contractor and PMC, further this will be shared with all relevantstakeholders for effective implementation of ESMP.Section 5.5 outlines a comprehensive generic Environmental and Social Management Plan (ESMP), incorporating findings from site visits. This document not only establishes contractual obligations for both contractors and Project Management Consultants (PMC) but also serves as a basis for engaging with relevant stakeholders to ensure the effective implementation of the ESMP.However, due to the site-specific conditions,AEGCL shall prepare sub-projects'ESIA/ESMP and/or RP based on this ESMPF/generic ESMPand submit toAIIB for approval prior to the contractors' mobilization.

The Contractor is obligated to execute the work in complete adherence to this Environmental and Social Management Plan (ESMP) and relevant National and State laws, as well as the standards and policies of AIIB in pollution control, waste management, and occupational health and safety. In the event of any inconsistency between AIIB policies and Indian acts, the guidelines of the International Finance Corporation (IFC) in general and the sector-specific Environmental, Health, and Safety (EHS) guidelines shall take precedence. The EPC Contractor is required to adhere to the ESMP throughout the entire project life cycle. The provisions outlined in the ESMP are formulated to prevent, reduce, and address any potential impact arising from project execution and operations. The EPC Contractor will incorporate and implement these provisions in its day-to-day activities and work executions.

7.19 Institutional Arrangement for Environmental and Social Compliance Monitoring and Reporting

Compliance monitoring plays a crucial role in the Environmental and Social Management and Planning Framework (ESMPF) to ensure the effective achievement of its goals and objectives. This process involves conducting on-site inspections of construction activities to confirm the implementation of measures outlined in the ESMP and specified in contractor clauses. This form of monitoring closely parallels standard technical supervision responsibilities, ensuring that contractors adhere to prescribed standards and maintain the desired quality of work.

The Environmental and Social (E&S) team at the Project Management Unit (PMU) and the Divisional E&S Staff of AEGCL, in collaboration with the Project Management Consultant (PMC), will oversee the project site throughout the initial, construction, post-construction, and operational phases. Their

primary responsibility is to ensure that all environmental and social issues related to each sub-project comply with the requirements outlined in the Environmental and Social Management Plan Framework (ESMPF).The Divisional Officers (AGMs) of PIU-AEGCL, with support from the PMC, will be responsible for preparing quarterly progress reports, which will then be submitted to the PMU. Subsequently, the PMU, in collaboration with the PMC, will compile semi-annual monitoring reports for submission to the AIIB. These reports will comprehensively address the implementation of the ESMPF, emphasizing compliance and any necessary corrective actions.Public consultations will be conducted as needed during the pre-construction, construction, and operational phases. The Environmental & Social Management Plan and Monitoring Mechanism of the Environmental and Social Impact Assessment (ESIA) for each Sub-Project will explicitly define the Environmental and Social Management Monitoring & Reporting Framework for Sub-Projects.

An external monitoring consultant will also be engaged to perform an unbiased assessment of the environmental safeguard management of Phase II under AISTSE project in line with the requirementsestablished in the ESIA-ESMP. The primary emphasis will be on scrutinizing the functionality and adequacy of the system addressing environmental aspects of both the project and its sub-activities. Additionally, the consultant will assess the implementation of mitigation measures and the effectiveness of established mechanisms as outlined in the ESIA-ESMP document.The monitoring findings will be used to identify any shortcomings/gaps, and an action plan will be recommended to enhance the project's functionality, ensuring its overall benefit and growth.

7.20 Capacity building

The ESMPF is specifically designed to establish a robust framework for addressing environmental and social issues throughout the project implementation process. During field site visits, discussions with AEGCL authorities at the field level revealed a lack of sufficient knowledge regarding the implementation of environmental and social safeguard measures. Consequently, it is imperative to provide continuous support from the project's inception through capacity-building programs.The AEGCL authorities need guidance and support to enhance their understanding and proficiency in planning, designing, and implementing measures that address environmental and social issues associated with the sub-projects. Achieving sustainability and seamless integration of environmental and social principles and safeguards across all implementing partners necessitates raising awareness and building capacity.As part of the ESMPF program developed for the project, a comprehensive strategy for Information, Education, and Communication (IEC) has been outlined. This strategy aims to foster environmental and social awareness and build management capacity within the project administration structure and the targeted communities. The capacity-building efforts for environmental and social management will be seamlessly integrated into the overall capacity-building component of the project.

7.21 Grievance Redressal Mechanism

A Grievance Redressal Mechanism (GRM) is established to address concerns and dissatisfaction among stakeholders regarding actual or perceived impacts of project interventions, aiming to find satisfactory resolutions. The project envisions two distinct grievance mechanisms: i) overseen by AEGCL-PMU, and ii) managed jointly by PIU-AEGCL and the EPC contractor. A Grievance Redressal (GR) committee within the PMU (AEGCL) will function as the appellate authority for the AISTSE Project. To streamline the process, existing platforms utilized by the PMU and PIUs will be seamlessly integrated into the GRM framework of the AISTSE project, with designated committees overseeing the resolution process. All grievances related to the project are systematically tagged, and a comprehensive register is diligently maintained to ensure transparency and accountability.

7.22 Budget for Implementation of ESMP

The adherence to the Environmental and Social Management Plan (ESMP) has been developed by considering optimal and reasonable expenses, which are determined through the minimization of mitigation measures on a "least-cost" basis. Failure to incur these expenditures could lead to notable environmental impacts from the project, resulting in the degradation of the biophysical environment in the region and, subsequently, adversely affecting the economies of local communities. Following the identification of environmental and social issues and the assessment of the project's impact on the environment, the estimated cost of the ESMP encompasses the implementation of crucial environmental measures and the formulation of an environmental and social monitoring plan.

Chapter 8: Stakeholder and Public consultations & Disclosure of Documentation

8.1 Consultation

According to GoI's EIA Notification 2006 (including amendments), public consultation and information disclosure will be undertaken through public notice prior to the approval by MoEF&CC only for Category B1 and A projects. During the initial stages of the Category B projects of AIIB, public consultation and information disclosure should be conducted by the client. This activity is conducted to understand the public perception of the project and address their concerns and suggestions during the project design. Further, public consultation is conducted to avoid or minimize conflict situation during the implementation of the project.

Public consultations including group discussions and focus group discussions were conducted in project-affected area from May 2023 to July 2023 by the project ESMPF consultants. People participated in the public consultations to express their views about the proposed project. The details of the public consultation are provided **Table** in and the photographs of the same are provided in **Appendix 18**.

Table 40: Summary of public consultations and issues raised

Sr. No	Location	Date	Participants	Issues Raised During Consultations
1	Existing 132/33 KV Rowta Substation	10/05/23	5	1. Since a reliable electrical supply is essential for all and many regions, especially rural regions of Assam are yet to received uninterrupted power supply, this project will be extremely helpful to meet the power requirements. 2. People are willing to donate their own property (if required) as long as they will be fairly compensated at market rates. 3. They believe the construction will offer many advantages in terms of employment. 4. The construction schedule should be established in the off season to minimize disruption of standing corps. 5. The public should be informed in advance when crops are being harvested.
2	Establishment of new 132/33 kV (2 X 50 MVA) GIS Substation at Lumding	11/05/23	7	
3	New 132/33kV (2x50 MVA) GIS Substation at Titabor	04/07/23	20	
4	New 132/33kV (2x50 MVA) AIS Substation at Dhing	05/07/23	15	
5	New 220/132/33kV (2x50 MVA) Substation at Morigaon	05/07/23	8	
6.	New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara	10/07/23	11	
7.	New 132/33 kV (2X 0 MVA) AIS Substation at Serfanguri	11/07/23	7	

The above mention issues were addressed while developing this ESMPF. The necessary design provisions like avoidance of damage to crop and other infrastructure of the area while construction of transmission lines is addressed under ESMP. To generate employment, utilization of local labour has been emphasized under the ESMPF.

8.2 Stakeholder's Consultation Framework

This framework provides future guidance for public consultation mechanism and process to AEGCL.

8.2.1 Social Inclusion

Social inclusion includes systematic engagement with vulnerable groups. The vulnerable and marginalized groups were specifically allowed to participate in the meaningful consultations through: Arrangement of the Public Consultation Venue in suitable places, which are commonly known to all the Stakeholders and also in the very convenient place to reach by th evulnerable and disabled people. Special care should be taken to arrange the Venue in a way to ascertain the attendance of women without any hesitation. The Public Consultations needs to be arranged in day time, excepting the usual peak time of their daily economic and personal activities to facilitate that all interested persons including the women, children and disabled persons to attend. The Public Consultations needs to be arranged preferably during normal holidays to ascertain that the vulnerable or marginalized people get assistance from other persons to reach and attend. Pre-informed consultation needs to be facilitated and the social inclusion of the vulnerable groups including women, disabled persons should have information at ease. Focus Group Discussion with the Vulnerable People, Indigenous/Tribal Communities and Females will be performed based on feasibility.

8.2.2 Type of Stakeholders

A stakeholder is either an individual, or organization that has an interest in it and may be impacted by the outcome of the project. A number of stakeholders including people involved in getting a project from inception to successful completion. Over the life cycle of a project, one stakeholder might be more vulnerable in terms of project objectives than another, whereas some stakeholders might demand more attention than others. The first step of the stakeholder engagement activities is their identification and characterization. The AEGCL through the external consultants should consult all key stakeholders on the project safeguard documents at least once during the process of assessment. The stakeholder consultation should provide a summary of the proposed project´s objectives and a summary of the ESIA conclusions. The key stakeholders to be consulted during project activity preparation and implementation should include:

- Project beneficiaries, Scheduled Tribes (STs) and project affected population / project affected families (PAPs/PAFs), Women Headed Household (WHH);
- Elected representatives, community leaders, and representatives of community-based organizations; business and industrial associations, etc.;
- Relevant local NGOs;

Other stakeholders:

- Local government and relevant government agencies, including the authorities responsible for land acquisition, protection and conservation of forests and environment, archaeological sites, religious sites and other relevant government departments (regulatory, administration and infrastructure services related);
- Residents, shopkeepers, business people, farmers, fisheries (owners and workers) who live and work alongside the project area and near sites where facilities will be built; custodians, and users of socially and culturally important buildings (CPRs);
- Vulnerable groups, women groups etc.

The implementing agencies (AEGCL) will conduct meaningful consultations with all relevant stakeholders who are directly or indirectly affected.

8.2.3 Meaningful Consultation

Meaningful consultation is a process that involves the public in providing their views and feedback onprojectproposaltoconsiderinthedecision-making. Meaningful Consultation activities provide specific stakeholder groups with relevant information and opportunities to voice their views on the project. Approaches to public consultation in this project have ranged from short-term programs to meet the regulatory requirements to a longer-term focus on relationship building and proactive risk management.

The activity types and their frequency are adapted tothe three main project stages: (i) Project preparation (including design, procurement of contractors and supplies), (ii) construction, and (iii) Operation and Maintenance. **Table** presents the stakeholder engagement activitiestobe undertaken for the project.

8.2.4 Stakeholder's Consultation Process

Consultations should be conducted in an atmosphere that is conducive to the project development and beneficial to the community and local population. The PMU should ensure that the consultations are free of compulsion and intimidation, are gender-inclusive, and tailored to the needs of disadvantaged and vulnerable groups. All relevant stakeholders will be informed in advance about the timing and format of the consultations. During the consultations, information about the project, its rationale, scope, benefits and costs, including potential environmental and social impacts and mitigation measures to be presented by the PMU with the support of the ESIA consultants. The type of approaches to be adopted in this process is given in **Table** .

Table 41: Stakeholder's Consultation Approaches

Project Stage	Consultation Activities	Remarks	Responsibility
Project Preparation	Household level consultations through sample questionnaire surveys on service levels, needs, priorities for project preparation.	One-time activity at the beginning of th eproject.	PMU
	Consultation with all line departments	At the start of the project; to discuss once draft ESIA is ready	PMU
	Focus group discussions with people residing/ working near theprojectsites	While initiating the survey, During the survey. Once the draft ESIA/RAP / IPP is ready	PMU
	Public Consultation with PAPs/PAFs	At various sstages, especially during, the preparation and Implementation of resettlement plan	PMU
Project Implementation	Focus group discussions with the people residing / working near the project sites	At various stages of ESMP implementation at work sites	PMU/PMC/PIU
	Informal discussions with the construction workers and construction supervision staff (contractor, consultants and PMU)	Throughout the construction period	PMU/PMC/PIU
	Informal discussions with commuters and general public along the roads where works are Implemented	At various stages of EMP implementation at work sites	PMU/PMC/PIU

This section describes the stakeholder consultation process that needs to be undertaken during the detailed assessments of the project activities or as and when needed.

The proponent (AEGCL) must meet at least with the principal stakeholders to inform them about the proposed project activity and to solicit their views about it. More extensive consultations are required for specific project activities that have significant impacts. The methods and results of the consultations shall be documented in the ESIA Report.

All consultations need to be a two-way dialogue with the aim of informing the stakeholders about the potential impacts (positive/negative) and obtain their feedback and views about the project activities and the proposed mitigation measures. All consultations need to be inclusive of all groups and gender, transparent and documented.

8.3 Stakeholder Engagement Plan (SEP)

PMU will prepare a consultation plan with all stakeholders. The proceedings and outcomes of these consultations need to be archived. For the ESIA, the PMU should, with the support of participants, summarize how the consultations were conducted, key topics discussed, and the decisions arrived at. These decisions will be incorporated into the ESIA and ESMP document. Photographic records and signatures of participants also need to be archived in the ESIA report. Stakeholder engagement plan consists of following three stages.

Stage 1: Identify the Objectives

The SEP sets out the process for undertaking engagement and consultation with stakeholders. Consultation with stakeholders isessential to obtaining the Project's social 'License to Operate' and facilitating the successful completion of the baseline socio-economic and environmental surveys. Stakeholders include local communities potentially affected by the survey activities and otherstakeholders not directly affected but who have an interest in these activities or who could affect their progress. These could include national and local authorities, neighboring projects and/or non-governmental organizations.

Stage 2: Define the Aims

TheSEPaimstoestablishtheprocessandtoolsto:

a. Identify and map stakeholders who have influence on the Project or who the Project influences, and identify and record key issues and concerns that stakeholders may have about the Project.
b. Identify whether there are any vulnerable communities/groups, and if so, engage with them in meaningful informed consultation.
c. Build trusting relationships with local stakeholders based on a transparent and timely supply of information, open dialogue, and provision of opportunities for stakeholders to voice opinions and concerns for informing Project design and mitigation measures, and minimizing impacts on local resources and/or stakeholders.
d. Keep stakeholders regularly informed about the Project's activities, explaining the nature of the construction and operation stages, overall Project duration, and any changes that could generate new impacts or increase the existing ones, and opportunities for grievance and engagement.
e. Demonstrate how national requirements, good international industry practice (GIIP) and IFC guidelines and corporate requirements have been addressed in the national EIA and/or EHIA.
f. Build positive stakeholder relationships and ensure ongoing stakeholder participation.

Stage 3: Implement Available Grievance Mechanism

Maintain a record of all consultations and grievances using a Stakeholder Database and Grievance Mechanism Database (or similar). The purpose of the stakeholder database is to document and record all stakeholder interactions to date. The grievance database specifically documents grievances recorded during and after the implementation of the project.

Table 42: Stages of Meaningful Consultations

Stages	Target Stakeholders	Topic(s) of Consultation	Method(s) used	Location/ frequency	Responsibilities
Stage 1: Project Preparation (ESIA, ESMP, RP preparation & Disclosure)	Primary Stakeholder, Project Affected persons, Other Interested Groups dwelling in adjacent villages, Vulnerable DPs, if any	Assistance in gathering official documents for land ownership and uses. Project scope and rationaleEnvironmental & Social principles Livelihood restoration options Grievance Redressal Mechanism process ESIA, ESMP, RP preparation and disclosure.	Public meetings with facilitating women and vulnerable groupFace-to-face meetings Mass/ social media communication (as and when needed) Disclosure of written information: banners, brochures, posters, flyers, website Maintaining COVID-19 restriction & PPE	Local Project Office for disclosure of ESIA, ESMP, RP etc. Survey of PAPs in affected villagesCommunication through Local Panchayat, Key Persons, mass communication, social media etc.	Project Authority & PMC Other Consultants, if any
	Local administrative Group, Panchayat Offices, Local Administration Government Departments etc.	Project information scope and rationale and E&S principles Coordination activities Resettlement & Livelihood Restoration Policies Grievance mechanism process ESIA, ESMP, RP preparation and disclosure	Public meetings, trainings/ workshops Mass/ social media communication Disclosure of written information: Brochures, posters, flyers, website Maintaining COVID-19 restriction & PPE	Project meetings in respective offices and in Public ConsultationsMeetings in affected Villages, as needed Communication through Letters, documents, telephone, video conference, e-mails, mass media, social media (as needed)	Project Authority and PMC DPR Consultant Other Consultants, if any
	Implementing Group Officials of AEGCL, GoA Consultants	Project information scope and rationale and E&S principles Coordination and management	Face-to-face meetings in small groups Trainings/ workshops/	Project meetings in respective offices & in Public Consultations Communication	Project Authority & PMC Other

Stages	Target Stakeholders	Topic(s) of Consultation	Method(s) used	Location/ frequency	Responsibilities
	& Sub-Consultants Contractors & Sub-Contractors, if any at this stage	strategies and activities Resettlement & Livelihood Restoration Policies (if any livelihood loss) Grievance mechanism process ESIA, ESMP, RP preparation and disclosure	presentations, if required Invitations to public/ community meetings Disclosure of written Documents, Brochures, posters, flyers, presentations, website Maintaining COVID-19 restriction & PPE	through Letters, documents, telephone, video conference, e-mails, mass media, social media (as needed)	Consultants, if any
STAGE 2: Project Construction and mobilization activities	Primary Stakeholder Affected Persons Other Interested Groups dwelling in adjacent villages Vulnerable DPs, if any	Grievance mechanism Environmental and social impacts (ESIA, ESMF, RP and community concerns) Livelihood opportunities Project status	Maintaining COVID-19 restriction & PPE Public meetings, open houses, trainings/ workshops facilitating women and vulnerable participation Individual outreach to PAPs, as needed Disclosure of written information, brochures, posters, flyers, website Information boards or desks Notice board(s) at project office and site Grievance mechanism	Quarterly meetings in affected villages during construction season Communication through Letters, telephone, e- mail, mass communication, social media, as needed Notice boards updated weekly Brochures in local offices	PIU & RP Implementation agency (if required in any case) Authority Engineer/ Supervision consultants Contractor/ sub-contractors GRC, if required.
	Local administrative Group Panchayat Offices Local Administration & Police	Project scope, rationale and E&S principles Grievance mechanism Livelihood Restoration/ Employment	Maintaining COVID-19 restriction & PPE (if required) Face-to-face meetings with small groups	Monthly during construction season or as and when needed	PIU & Local community Authority Engineer/ Supervision consultants Contractor/ subcontractor

Stages	Target Stakeholders	Topic(s) of Consultation	Method(s) used	Location/ frequency	Responsibilities
	Stakeholder Government Departments	opportunities Progress and Status on ESMP, Livelihood Restoration Overall Project Status and Progress	Joint meetings with different departments/ stake-holders Joint public/ community meetings with PAPs Telephonic, e-mail, social media communications Documents, Letters, photographs etc.		s
	Implementing Group Officials of AEGCL, GoA Consultants & Sub-Consultants	Project scope, rationale and E&S principles Grievance mechanism Training on Livelihood Restoration/ Employment opportunities Progress and Status on ESMP, Livelihood Restoration Coordination and management strategies and activities Overall Project Status and Progress	Maintaining COVID-19 restriction & PPE Face-to-face meetings with small groups Trainings/ workshops/ presentations, if required Invitations to public/ community meetings Disclosure of written Documents, Brochures, posters, flyers, presentations, website Information boards or desks Notice board(s) at project office and site Grievance mechanism	Weekly during construction season or as and when needed	PIU Authority Engineer/ Supervision consultants Contractor/ subcontractors GRC, if required

8.4 Information Disclosure

Information disclosure is a critical component of the engagement activities to be undertaken for the project. The information disclosure policy is meant to ensure that information about the proposed project activities will be made public. All interested parties, those who are impacted, and the broader public must get information on a timely and consistent basis. The transparency accountability, and validity of AEGCL's operations will be aided by the public's access to the information and documents it produces or holds.

The method of information sharing should be transparent and open to anyone. Briefing materials and planning of community consultation of meetings are two significant strategies that have been used up to this point. The briefing materials may take the following forms and must be created in the local language.

- Brochures (including project information, land requirements and details of entitlements including compensation and assistance to be given to the PAPs) that can be kept in the offices of local self-government (municipal office in case of urban area and gram panchayat office in case of rural area) and AEGCL;

- Posters to be displayed at prominent locations and (c) leaflets that can be distributed in the impacted zone of the sub project. Consultation meetings should also be organized at regular intervals by the AEGCL to acquaint the PAPs of the following.

    - Timeline and progress of the project
    - Information on compensation and entitlements
    - Information on land acquisition and market valuations of property
    - Timeline for acquisition

In order to relocate common and cultural property, it also necessary to seek the opinion and agreement of the community. Under the Right to Information Act, which took effect in October 2005, information disclosure procedures are required to disclose citizen centric information as well as all the documentation required for responding to any inquiries. All records must be disclosed in line with the applicable RTI Act rules as part of the organization's disclosure policy, unless otherwise prohibited by law. A designated information officer is in charge of making sure that information is distributed completely and on time in accordance with this policy. Disclosure of information will enhance governance and accountability specifically with respect to strengthening of monitoring indicators to help the AIIB Bank monitor compliance with the agreements and assess impact on outcomes.

The information disclosure will be undertaken primarily through two means; ***preparation and dissemination of briefing material*** and ***organization of community consultations or group meetings***. Key goal of the disclosure process will be to make information accessible and available to all in a simple and easy to understand manner. The briefing material shall be prepared in local language, i.e. Assamese. Following communication tools shall be designed for effective dissemination of relevant information:

- **Executive Summary of ESIA-ESMP Reports:** The translated version of the ESIA-ESMP report in to local language (Assamese) will be kept at the offices of local gram panchayats, AEGCL website and also at the project office.

- **Non-technical Summary/Brochures in Assamese:** Sufficient number of the brochures will be circulated during subsequent public meetings/individual consultations during project implementation.
- **Posters on Grievance Mechanism along with contact details:** To be made available at the Gram Panchayat office and other government offices where local people gather frequently.

All documents shall be made available to the public in accordance with relevant provisions of the RTI Act, except when otherwise warranted by legal requirements. Information shall be provided in a timely and regular manner to all stakeholders, affected parties and the general public.

Information to be Disclosed

Table specifies the type of additional information and frequency of dissemination of projects which are financed either from domestic or donor's funds. The type and timing of the disclosure, channels to be used, frequency and duration of disclosure are also presented in the **Table 43**.

Table 43: Summary of Information Disclosure Plan

Topic	Documents to be Disclosed	Frequency and Duration of Disclosure	Where/Channel of Disclosure
Resettlement, Rehabilitation and Land Acquisition	Resettlement Plans (RPs) and Indigenous People Plans (IPPs, if required), with Executive Summaries in local language, and in English.	Once in the entire project cycle. But to remain on the website and other disclosure locations throughout the project period.	AIIB's website. On the website of AEGCL, the client would make the RP available at a place accessible to displaced persons and, manner, and language that are understandable to the PAPs Local municipal and gram panchayat office.
	Resettlement & Rehabilitation Policy translated in local language	Once in the entire project cycle.	Distributed among Project Affected Persons (PAP)
	Information regarding impacts and their entitlements in local language. R&R and LA monthly progress report.	Once at the start of the project and as and when demanded by the PAP. 10th day of every month	Through one-to-one contact with PAPs, Community consultation with sharing the list of PAPs with impacts and entitlements. Hard copies of all disclosed documents in the office of contractor.
	RP Impact Assessment Report	At midterm & end of RP implementation	AEGCL website in local language.
	Land Acquisition notifications	As required under the RFCTLARR Act 2013 And Assam RFCTLARR Rules 2015	The Gazette notification in newspaper and Hard copy in the office of contractor in local language
	Grievance redressal process.	Continuous process throughout the project cycle.	AIIB Bank's web site. On the web sites of AEGCL. Hard copies of all disclosed documents in the following offices: • Local municipalities / • Gram panchayat office
Public Consultation	Minutes of Formal Public Consultation Meetings	Within two weeks of meeting	AEGCL divisional office (PIU), Project Manager of EPC Contractor etc.
Environmental and Social Management	Construction Schedule including movement of heavy machinery, ESIAs	Before the start of the project construction phase	AEGCL divisional office (PIU), Project Manager of EPC Contractor etc.

Topic	Documents to be Disclosed	Frequency and Duration of Disclosure	Where/Channel of Disclosure
	with Executive Summaries in Assamese, Hazardous Waste Disposal E&S monitoring report		
Implementation	Information regarding Land losers and their entitlements in local language (in case of land acquisition by LARR 2013/ LARR Assam Rules 2015)	Once at the start of the project and as and when demanded by the PAP	Through leaflets, or other IEC materials, especially developed for the purpose in local language, One to one consultations with project affected people (APs) Community consultations List of land losers along with the compensation amount to be put up at AEGCL head office, AEGCL Divisional Office /Sub-Divisional Office etc.

In addition to the information specified in the table, the following information shall also be displayed / disseminated, wherever applicable.

- Project specific information need to be made available at each contract site through public information kiosk
- Project Information brochures shall be made available at all the construction sites as well as the office of implementation agency and the office of Engineer incharge.
- Wherever civil work will be carriedout aboard will be put up for public information which will disclose all desired information to the public, for greater social accountability.
- All information will be translated into local language and will be disclosed to the public through the Panchayat, District Magistrate's office, concerned project offices, websites of AEGCL.

8.5 Mechanism of Information Disclosure

Information will be disseminated to displaced persons at various stages of the project through projectselection, preparation and project implementation period. For the benefit of the community in generaland displaced persons, in particular, a summary of the Resettlement Planning Framework and respectiveResettlement Plan of the sub-project will be made available in vernacular language during consultationmeetings and will be disclosed in public places prior to project appraisal. This will enable stakeholders to provide inputs on the resettlement process, prior to award of civil work contract. The details of AIIB's Project affected People's Management requirements have been described in the **Appendix 19.**

Information dissemination and Public Consultation methods will chronologically follow the basic methods of:

- Meeting and discussion with the Project Officials
- Introduction and discussion with Panchayat Pradhan
- Meeting and discussion with State level and District level stakeholders
- Meeting and discussion with Block level stakeholders
- Meeting and discussion with Gram Panchay at officials
- Discussions with the Panchayat Members, Key personnel and local leaders of respective villages

Chapter 9: Institutional Arrangements and Capacity Building

9.1 Introduction

AEGCL is both the Executing Agency (EA) and Implementation Agency (IA) for the project. **The Project Management Unit (PMU)** at HQ will be headed by Chief General Manager (PP&D) and act as Project Director for the Project under overall supervision of Managing Director; AEGCL, who will be assisted by corresponding personnel from various functions – Administration and Finance, Projects Planning and Design, Procurement and contracts, and Environment & Social Staff of PMU.

Project Implementation Units (PIUs) at field level, will be headed by the Deputy General Manager of respective T&T Circles and act as Project Authority. Whereas at divisional level, the project will be headed by Assistant General Manager (AGM) and act as Project Manager under the super supervision of the respective Project Authority (DGM).

The environment and social specialist of PMU looks into the technical and administrative parts of environmental and social issues related to the transmission lines and sub-station establishments and its functionalities. For implementation of the AIIB funded project, the AEGCL will hire project management Consultant (PMC) for technical and managerial inputs.

Apex position: Project Director (CGM level) will be accountable for overall supervision, coordination and responsibility of the Project planning, implementation, and monitoring. The PMC will provide their expertise &support to PMU. Two Environmental and two Social safeguard specialist will be part of the PMU. The E&S Officers will have an overall responsibility for overseeing the A/RPs and IPPs (if applicable) as well as implementation of ESMPs, Forest clearance etc by coordinating with Experts from PMC andEPC contractors with the help of all the AEGCL Divisional Offices. The E&S staff of PMU will also be responsible for review and finalisation of ESIA-ESMP report, progress monitoring of E&S compliance during project execution, semi-annual/ annual reports on E&S compliance,etc. and submission of the all the requisite reports & status to AIIB. The structure of PMU is described below (**Figure 25**).

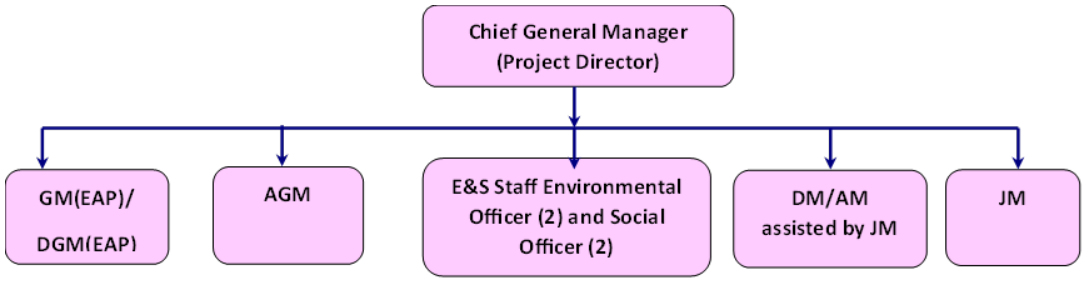


Figure 25: Organization Structure of PMU

In the Divisional offices, Officers (DM/AM) will be assigned to look after E&S components. The officer will look into the E&S compliance, liaising with local authorities in connection with different permits and licenses, redressing the public complaints on E&S issues, etc. The tentative structure proposed at circle and divisional level is given in **Table 44**.

Table 44: Institutional Arrangement for E&S compliance Monitoring

Asian Infrastructure Investment Bank (AIIB)	1. Project Team Leader 2. Environmental Specialist

	3. Social Specialist
Assam Electricity Grid Corporation Limited	
Project Management Unit (PMU)	1. Chief General Manager (PP&D) cum Project Director. 2. Chief General Manager (O&M) for LAR, CAR and UAR. 3. General Manager, (EAP) HQ 4. DGMs (EAP) HQ 5. AGMs (EAP) (4) 6. Environmental & Social Specialist (2+2) 7. Concerned DMs/AMs 8. Concerned JMs
Project implementation Umit (PIU)	1. General Manager, for LAR, CAR and UAR T&T Zone. 2. Deputy General Manager cum Project Authority– T&T Circle 3. Assistant General Manager cum Project Manager (Divisional Officers) 4. Designated officers (DM/AM) to look after E&S Components.
Project Management Consultants (PMC)	1. Team Leader (1) 2. Environmental Expert (1) 3. Social Expert (1) 4. E&S Support staff (3+3)
Contractor	1. Project Manager (1 – Package wise) 2. Community Consultation Officer (1 – each project site) 3. Health and Safety Officer (HSE) (1 – each project site) 4. Environmental Officer (1 – each project site)

9.2 Organizational Responsibilities

The Environment and Social staff at the PMU will be responsible for monitoring the policy and implementation related to environmental and social impacts mitigation of all projects of AEGCL. The E&Sofficials of PMU will assist both PMU and Divisional E&S officers in managing environmental and social aspects of the projects in compliance with the ESMPF. As per AIIB's Policies, PMU is required to conduct and report regular monitoring of environmental and social compliance of projects funded by AIIB to ensure compliance with the ESP.

The implementation of the ESMP during the construction phase is the responsibility of the Contractors. The PMC and PMU is responsible for ensuring all measures mandated by the ESMP are included in the design and bid documents. The E&S officer at divisional level under supervision of E&S staff of PMU are responsible for monitoring and enforcement of the ESMP during construction.

The duties of the E&S staff at PMU are:

- Monitor the implementation of mitigation measures during construction and operation phases of the project.
- Advise and coordinate field unit's activity towards effective environmental and social management.
- Liaise with the Ministry of Power, MoEF&CC, GoA and state agencies such as SPCB Assam, Department of Environment and Forest, District Revenue and all concern line department and seek their assistance to solve the environmental and social issues of the project.
- Advice to project planning/design cells on environmental and social issues while route selection of the alignment of transmission line and sub-station construction site selection at the planning/design stage to avoid negative environmental and social impacts. Similarly advise for inclusion of environment and social safeguard provisions in contract documents.
- Advise PIU on training and awareness raising for environmental and social issues to the

project/contract staff.

The duties of the E&S Officer at Divisional (site) level are:

- Ensure implementation of the environmental and social policy guidelines and environmental and social good practices at the sites.
- Advise and coordinate the contractor(s) activity towards effective management of environmental and social issues.
- Liaise with the local officers of forest department, SPCB Assam, Revenue and all relevant line department, and seek involvement of their officers in resolving environment & social issues, wherever applicable.
- Carry out environmental and social survey to avoid negative impacts.
- Make the contractor staff aware of environmental and social issues so that ESMP could be managed effectively.
- Prepare/review site visit report for environment and social compliance.

The duties of the Environmental Expert and Social Expert of PMC are:

- Preparation & execution of the sub-projects specific ESIAs, ESMPs, RPs, IPPs (if applicable), Public consultation Plans/community engagement plans for the entire project.
- Development of monthly, quarterly and semi-annual progress reports with respect to environmental and social safeguard compliance to local, national regulations and AIIB's ESP.
- Inclusion of climate change and mitigation measures in project designing stage.
- Maintain the record/ documentary evidence for all statutory clearances as applicable to the project.
- Review contract documents to ensure that ESMPs provisions related to works are included in the contract documents.
- Oversee and report to the PMU on implementation of ESMPs provisions included in the works contract for the sub-projects.
- Act as a resource person in trainings based on experience on implementing this project and previous relevant work.
- Providing capacity development training to PMU (quarterly) and contractor personals (monthly).
- Ground Truthing of documents submitted by contractor.

The duties of the E&S Officer at Contractor's level are:

- Preparation and implementation of Contractors' ESMP report.
- To collect a full set of baselines at each site as a benchmark, prior to the mobilization.
- Lead the implementation of ESMPs measures included in the Contract.
- Preparation of Scheme including details of land and other resources required.
- Development of inventory for tree cutting/pruning along RoW, liaising with various government departments for utility shifting and obtaining regulatory clearance in consultation with AEGCL officials.
- Public consultations in presence of PMU, PMC, district authorities, divisional officers and E&S staff of PMU to be undertaken if required.
- Maintaining statutory clearance documents (labor license, migratory labor license, Primary monitoring documents, Environmental Clerance for borrow earth, pollution under control certificate for vehicles, workers compensation insurance etc.)

- Health and Safety Training of workers (Use of PPEs, fire safety and electrical safety trainings, construction safety trainings, training for working on height, HIV/AIDS trainings etc.).
- Organizing health checkup camps for workers, authorizing height pass for workers, maintaining register for issuing PPEs.
- Daily report on incidents and near miss, monthly report on ESMP implementation for each subproject, report on progress and shortcomings of the measures implemented to E&S Expert of PMC.

9.3 Capacity Building

AEGCL has experience in implementing multiple projects funded by the Asian Development Bank, Non- Lapsable Central Pool of Resources (NLCPR) Scheme, World Bank and as well as the ongoing AIIB funded AISTSEP of Phase-I. The review of AEGCL's past experience in implementation of E&S management highlights its approach towards dealing with environmental and social concerns which included both strengths as well as short comings when dealing with regulatory frameworks. For instance, power transmission projects are exempted for environment clearances in the country, hence the weak application of environmental regulations and CEA regulations was an outcome of the low staff awareness about the related regulatory guidelines. In addition, as a general practice, AEGCL relies on hired consultants for the development and implementation R&R plan and RAP. However, AEGCL lags behind in the consideration of social aspects at project conceptualization, planning and implementation stages. Further, the monitoring of social aspects beyond compensation has suffered from delay of information/data from contractors and bureaucratic issues.

Considering the strengths, AEGCL has addressed environmental and social concerns based on principles of avoidance, minimization and mitigation in their past funded projects along with the support of consultant. Some common practices being followed by AEGCL include minimizing the loss to standing crops by avoiding any construction activity in harvesting season, to honour its commitments and to maintain the social fabric of the community, AEGCL tries to avoid Resettlement and Rehabilitation (R&R) in all its projects by trying to use Government waste land for most of their new proposed substation sites. As part of regulatory compliance AEGCL ensures proper valuation of land and assets of PAPs by the revenue department. All stakeholders including the public and the local authorities are consulted on socioeconomic issues that arise from its project activities prior to commencing the construction activity.

Recognizing its weaknesses which include lack of inhouse Environmental and Social expertise and greater dependency on E&S consultants, absence of a centralized Grievance redressal committee and mechanism for all the projects, incorporation of E&S aspects from project conceptualization stage, AEGCL has plans to incorporate appropriate changes by means of recruiting and capacity building of in house Environmental and Social Staff to oversee the work by consultant, development of GRC as well as defining criteria to include public consultation and E&S preliminary assessment activity part of project initiation stage to address the same, in view of the proposed project.

Consultations with AEGCL reveal the steps already being initiated in this direction. This largely involves expanding its ESC, and the coordination of both PIU and PMU under one authority (Project Director); and plans for orientation and training of its staff.

To build and strengthen the capability of AEGCL Officials associated with AIIB project, Sub project Associated Officials and to integrate sound environmental and social management framework into the sub-project implementation.

Table 45: Details of Training Programmes

Sr. No.	Types of Training	Number of Training
1	Training on Implementation of ESMP for PMU and PIU (Once per year for 4 years) EPC contractors: (Twice per year for 4 years)	12
2	Health & Safety Awareness Camp: Pre-Construction- Once Construction- 2 times / year for 4 years Operation- Once	140
3	Training on Implementation of GRM (Bi-annually for 4 years)	96
4	Training on Occupation Health and Safety (Quarterly for 4 years)	224

AEGCL will be responsible for selection of suitable trainees for the training, and the expense will be borne by the overall project capacity building budget and Schedule. The training will include a project launch training workshop and annual reorientation and learning workshops on environmental and social assessment and management.

Chapter 10: Resettlement Planning Framework

The Resettlement Planning Framework (RPF) for the Project has been designed in accordance with the applicable ESP ESS2, National and State laws as well as with international standards for social impact management. The framework is built on the principle of avoidance, minimization and mitigation wherein preference is given to avoiding negative social impacts wherever possible. The rationale for the RPF is originated from the fact that specific subproject sites and activities are yet to be identified to understand the exact nature and scale of their impacts. Thus, this RPF has been developed to guide detailed resettlement planning to address land acquisition and resettlement impacts. This framework establishes the involuntary resettlement and compensation principles to be applied to meet the needs of the people who may be affected by the project activities resulting due to permanent or temporary land acquisition, restricted use of land, loss of shelter, assets or livelihoods, and/or loss of access to economic resources. The framework has been developed based on the following policies/ legislations:

- The Right to Fair Compensation and Transparency in Land Acquisition and Rehabilitation and Resettlement Act 2013 (RFCTLARR Act 2013)
- Assam Right to Fair Compensation and Transparency in Land Acquisition and Rehabilitation and Resettlement Rules, 2015 (ARFCTLARR Rules 2015) and Government of Assam Revenue & Disaster Management (lr) Department Assam Secretariat (civil): Dispur: Guwahati - 6 notification orders by the governor dated Dispur, the 23rd August, 2023 (**Appendix-20 (a)**).
- Govt. of Assam notification regarding RoW Compensation for Transmission Line and tower footing dated 10th March 2017 (**Appendix-20(b)**).
- The Electricity Act, 2003
- The Indian Telegraph Act, 1885
- The Asian Infrastructure Investment Bank (AIIB)'s Environmental and Social Policy and Environmental and Social Standards (ESS 2: Involuntary Resettlement).

The format for preparation of Resettlement Action Plan (RAP) is given in **Appendix 21.** The entitlement matrix recognizes that the lack of title or customary rights recognized under law will not be a bar to entitlement and has special provisions for non-titled persons.

10.1 Principles of Resettlement Planning Framework

Based on the laws of Government of India, Government of Assam and AIIB's Environmental and SocialFramework (ESF), the core principles of this RPF that is to be followed for each sub-project is:

- Land acquisition, and other involuntary resettlement impacts will be avoided or minimized exploring all viable alternative sub-project designs.
- Where land acquisition is unavoidable, time-bound resettlement plans (RPs) will be prepared and PAPs will be assisted in improving or at least regaining their pre-project standard of living.
- Consultation with APs on compensation, disclosure of resettlement information to APs, and participation of APs in planning and implementing sub-projects will be ensured.
- Vulnerable groups will be provided special assistance in all such instances.
- Payment of compensation will be done to PAPs including non-titled persons (e.g., informal dwellers/squatters, and encroachers) for acquired assets at replacement rates.

- The payment of compensation and resettlement assistance will be done prior to the contractor taking physical acquisition of the land and prior to the commencement of any construction activities.
- There will be provision of income restoration and rehabilitation in cases displacement – physical or economic.
- Appropriate grievance redress mechanisms will be established prior to project works which will be open to APs, as well as workers for each sub-project.

10.2 Objectives of Resettlement Planning Framework

The main objective of the RPF is to appropriately identify, address and mitigate adverse socio-economic impacts that may occur due to the implementation of projects that involve the securing of land and subsequent resettlement of affected families. The plan would identify the full range of people affected by the project and justify their displacement after consideration of alternatives that would avoid or minimize displacement. This RPF applies to the PAPs, whose lands will be permanently or temporarily affected by compulsory actions due to any land acquisition and/or restriction of access required for the Project's development. It also applies to people who lease private or state-owned lands or those who have no registered or legal rights over the land they use, and who will be adversely affected as a result of the Project. However, the RPF does not apply to state land that is transferred from one state entity to another, or used temporarily by the PIU during construction works, unless third parties are adversely affected by the transfer or use. The specific objectives of the RPF are:

- detail GoI's legal solutions in all events of involuntary resettlement, relocation and loss of assets, including legal and administrative procedures and compensation paid for loss of assets; compare them to AIIB's ESS2 and international good practices; and provide the way to bridge the gaps;
- identify key institutions, besides AEGCL, involved in the Project implementation, including especially legally authorized state institutions implementing the procedures and safeguards of involuntary resettlement process; including AEGCL measures and monitoring in order to provide compliance with ESS2, international good practices, RPF and individual A/RPs;
- identify stakeholders and ways of their engagement in course of Project implementation.
- present PAPs eligibility criteria and compensation entitlement matrix according to type of loss assets;
- define the process of identification and evaluation of affected assets and the value of compensation to replace the loss of assets;
- describe mitigation measures under this RPF and individual A/RPs, including procedures in orderto minimize impacts on PAPs during Project implementation, including specific mitigation measures provided for vulnerable groups and women;
- define grievance and complaint rights, process, bodies and procedures available to PAPs during the whole course of Project implementation, including feedback reporting;
- describe and provide directions to preparation of individual A/RP and approval procedure, future A/RP outlines and their implementation process;
- specify requirement of public disclosure, disclosure of documents, public and local community involvement especially including public consultation in the PAP community during process of involuntary resettlement and Project implementation that may result in loss of assets;
- establish a gender-sensitive framework for resettlement in order to determine differential impacts since economic and social disruption do not result in equal hardship for women and men;

The sub-projects under the AISTSEP, will broadly have three types of potential impacts that will require mitigation measures. The types of impacts are:

- Loss of assets, including loss of land/ or restricted use land and structures
- Loss of income or livelihood
- Collective impacts on groups, such as loss of common property resources and loss of access or limited access to such resources.

Every effort will be made during the preparation of detailed design to minimize acquisition of land and other assets and to reduce any involuntary resettlement impacts. Unforeseen impacts will also be compensated in accordance with the principles of this RPF.

Additionally, the issues related to the Right of Way (RoW) for the transmission lines will be dealt with proper care especially for the temporary loss. The loss of crop and agriculture during the construction of the transmission lines will be paid as instant cash compensation for the damaged period. Although, the Right of Way is reserved for future activities, i.e., repair etc. by the executing agency (AEGCL), but in practice, people will be allowed to use the land below the lines after the construction. AEGCL will provide cash compensation to the APs for the temporary loss of crop, if occurred, during the time of maintenance and repair.

10.3 Definitions

The definitions of the terms used in the Resettlement Planning Framework are provided below:

- **Agricultural Land**: Land used in agriculture and other related activities is known as agricultural land. This includes land used in agricultural operations, dairy farming, poultry farming, pisciculture, sericulture, seed farming, breeding of live stocks, nurseries growing medicinal herbs, garden produce, grazing of cattle etc.
- **Assistance**: All supporting mechanisms viz monetary help, extension of services, training of staffs and assets given to Displaced Families constitute assistance in this project.
- **Cut-off Date**: The Cut-off Date is defined as the date, after which any families of Titleholders and Non-Titleholders entering into the project area, will not be eligible for any entitlement and assistance from the project. The date of general notice by District Level Land Purchase Committee (DLLPC) in Direct Purchase Policy or Preliminary Notification, u/s 11(1) of RFCTLARR Act 2013 will be treated as the cut-off date of Titleholder affected families whose land will be acquired through Direct Purchase or usual land acquisition process respectively. The Cut-off Date for Non- Titleholder Displaced families will be defined as the date of Social Census Survey for the sub- project.
- **Displaced Person (DP)/ Displaced Family (DF):** In the context of involuntary resettlement, Displaced Persons/ Displace family are those who are physically displaced (relocation, loss of residential land, or loss of shelter) and/or economically displaced (loss of land, assets, access to assets, income sources, or means of livelihoods) because of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. It covers them whether such losses and involuntary restrictions are full or partial, permanent or temporary.
- **Encroacher**: Any entity/person who built his/ her structure in whole or in part of an adjacent land to which s/he has no legal title.
- **Squatter**: Those persons who have occupied public/ government lands with no recognizable rights for residential or commercial or both purposes. The families, who have built their own structures on the land of the landlords with some financial arrangements, which are

not properly documented or legalized, are also considered as squatters.

- **Land Owner**: Land Owners are as per recorded in revenue records, or Land occupiers with claims/ rights recognized under State/ Central laws, including who is entitled to granted Patta rights on the land under any laws of the State including Eksonia Land
- **Replacement Cost**: Replacement cost is the amount of money to be required by any displaced person to replace the existing asset with an equally valued or similar asset at the current market price. It includes the transaction costs and taxes, if any.
- **Residual Land**: Residual land can be defined as the remaining portion of a land parcel left with the owner after the involuntary acquisition of land by the project authority.
- **Tenant**: A tenant is someone who pays rent for the place where they reside in, or for land or buildings that they use. The family residing/ occupying in the structures with some financial arrangements with the landlords, which may not be properly documented or legalized, are also considered as tenants.
- **Wheeler Vendor**: A Vendor operating in a cart like structure on two or more wheels. Wheelers are used mainly by mobile hawkers.
- **Women Headed Household (WHH)**: A household that is headed by a woman is called a Woman Headed Household. The aforesaid woman may be a spinster or a widow or separated or deserted by her husband.
- **Vulnerable Group/ Persons**: Vulnerable group/ persons are those with challenges that make them at higher risk of falling into poverty compared to others in the projects area. The Vulnerable Group/ Persons include the following categories: (i) DFs falling under 'Below Poverty Line' (BPL) category; (ii) persons who belong to Scheduled Castes (SC) and Scheduled Tribes (ST); (iii) Women Headed Households; (iv) Elderly people living alone; and (v) Physically and mentally challenged / disabled people.

10.4 National Regulations and AIIB Policy on Land and Asset Acquisition

Mandatory Social requirements for AEGCL at State level include provisions of section 67 & 68 (5 & 6) of the Electricity Act, 2003 for the calculation of compensation for any temporary damages. Involuntary land acquisitions, if any done, for securing private lands for construction of sub-stations, fall under the realm of The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 (RFCTLARRA). Whereas AIIB's ESS-2 covers the policies for involuntary resettlement planning. GAP analysis and measures to bridge the GAP are briefed in the **Table 46**.

Table 46: National Regulations and AIIB Policy on Land and Asset Acquisition

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
Additional assistance to PAPs	The Act has the provision of transportation cost of Rs. 50000/- for each displaced family and one-time resettlement allowance of Rs. 50000/- for each affected family to provide support during relocation.	It is necessary to provide assistance during relocation; particular attention is to be paid to the needs of poor and vulnerable individuals and groups.	AEGCL will ensure providing financial assistance to PAP's as per GoI regulations, which generally covers the provisions of AIIB's ESS2.
Livelihood restoration and assistance	The Act provides for various types of support to affected and displaced families. It employment to one member of the displaced family if jobs are created under the project by providing suitable training or onetime payment of Rs. 5 lakhs to restore their livelihood and living standard. Besides, a subsistence grant @ Rs. 3000/- per month for 12 months to each displaced family. In addition to this amount, the Scheduled Castes and the STs families displaced from the Scheduled Area shall be paid one-time financial assistance of Rs. 50000/-.	ESS 2 provides that the RP or policy include measures to ensure that the displaced persons are (i) offered support after displacement for a transitional period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standard of living; and, (ii) provided with development assistance in addition to compensation measures, such as land preparation, credit facilities, training or job opportunities.	AEGCL will ensure the livelihood restoration and assistance as per GoI regulation. which generally covers the provisions of AIIB's ESS2.
Resettlement instruments, census and social impact assessment	Conducting Social Impact Assessment (U/s 4 of the Act) is mandatory before the land acquisition for the project is initiated under the RFCTLARR Act, 2013. Preparation of the Resettlement and Rehabilitation Scheme (U/s 16 of the Act) is compulsory. Census, the socio-economic survey, and consultations are carried out for the preparation of Resettlement Plan for all externally funded projects. Depending upon the magnitude of impacts, a RAP shall be prepared for each sub-project separately.	Preparation of individual RPs, census survey and social impact assessment.	As per GoI norms development of RP or socio-economic survey is not required for transmission line projects as no land acquisition is required for area under tower footing. The preliminary assessment does not envisage and Land acquisition for substation land. Thus, does not require development of RAP. AEGCL will insure the development of subproject specific RAP.
	Conducting meaningful consultations with		AEGCL will ensure that public consultation and

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
Meaningful consultations	affected persons and others and disclosure of the report mandatory exercise as per the Act. Section 5, Section 6, Section 18, and Section 19 are related to consultation and disclosure. The public hearing for SIA is conducted in the affected area after giving adequate publicity and pre-fixed date, time and venue.	Meaningful consultations with affected persons and communities, local authorities, and, as appropriate, nongovernmental organizations need to be carried out.	disclosure is carried out during entire project duration. Consultation is to be carried out with affected persons and other and disclosure is to be made as per GoI regulations and AIIB's policy.
Cut-off date for eligibility and census	The cut-off date is the date for determining the entitlements (compensation and assistance) to all those who are affected by the project irrespective of the ownership of titles. According to the Act, the cut-off date for assistance to those depending on affected private lands is three years preceding the acquisition and for the titleholders, it is the date of notification under the said Act. Thus, in case of land acquisition, the date of issue of public notice of intended acquisition under Section 4(1) under the Act will be treated as the cut-off date for title holders.	Normally, the cut-off date is the date the census begins. The cut-off date could also be the date the project area was delineated, prior to the census, provided that there has been an effective public dissemination of information at the area delineated, and systematic and continuous dissemination subsequent to the delineation to prevent further encroachment.	The Act does not cover encroachers, squatters, and others collectively known as non- titleholders. For non-titleholders, the cut-off date will be the start date of the census survey/enumeration of affected persons for each sub-project.
Timing of compensation of payments	The Act ensures that the possession of land is taken after full payment of compensation (within 3 months) as well as resettlement entitlements (within 6 months) to entitled persons from the date of award U/s 30 of the Act.	The compensation should be provided before construction work start and before taking possession of the assets	AEGCL will ensure that compensation is provided before construction work start and before taking possession of the assets
Resettlement of formal owners of immovable property except agricultural land	The Act provides compensation and resettlement and rehabilitation assistance to entitled persons. The market value of the immovable property is determined as per the current BSR of the State/District and then solatium is added @ 100%. The value of the immovable property without depreciation along	Option 1: Cash compensation: Cash compensation at replacement cost. Option 2: Resettlement: Replacement property of equal or higher value and similar productivity Moving and transitional allowance administrative fees	AEGCL will ensure the Resettlement of formal owners of immovable property as per GoIregulation. which generally covers the provisions of AIIB's ESS2

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
	with solatium is the replacement cost. The entitled person is eligible for following resettlement and rehabilitation assistance: (i) provision of a housing unit in case of displacement; (ii) subsistence grant @ Rs. 3000/- per month for 12 months to each displaced family; (iv) transportation cost of Rs. 50000/- for each displaced family; (v) one-time resettlement allowance of Rs. 50000/- for each affected family; (vi) provision of stamp duty and registration fees if a house is allotted to the affected families. The Scheduled Castes and the STs families displaced from the Scheduled Area shall be paid one-time financial assistance of Rs. 50000/- over and above the resettlement and rehabilitation assistance mentioned above.		
Acquisition of agricultural land	The Act provides compensation and resettlement and rehabilitation assistance to entitled persons. The market value of land is determined as per section 26 of the Act which is the replacement cost. The multiplication factor for land acquisition compensation shall be determined by the distance of the acquired land from the nearest urban area. The factors are as follows: • Up to 10 KM: 1.2 • From 10 to 20 KM: 1.4 • From 20 to 30 KM: 1.6 • From 30 to 40 KM: 1.8	Resettlement: Replacement property of equal or higher value and similar productivity Moving and transitional allowance administrative fees	AEGCL will ensure that the Acquisition of agricultural land (if involved) will be as per GoI regulation. which generally covers the provisions of AIIB's ESS2

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
	• From 40 Km and above: 2.0 Besides, compensation entitled persons are eligible for resettlement and rehabilitation assistance which includes the following: (i) onetime payment of Rs. 5 lakhs to restore their livelihood and living standard; (ii) subsistence grant @ Rs. 3000/- per month for 12 months to each displaced family; (iii) provision of stamp duty and registration fees if the land is allotted to the affected families.		
Resettlement of informal ownersof buildings	The Act does not cover informal owners of buildings known as non-titleholders.	PAP is entitled to cash compensation at replacement cost for construction of similar quality construction with additional moving and transitional allowances AND The value of time invested in construction	AIIB does not differentiate between the titleholders and non- titleholders (encroachers, squatters, tenants, etc) except for compensation for land. Assam Electricity Grid Corporation Ltd. (AEGCL), Govt of Assam, recognizes existence of such informal owners and occupants of the building (encroachers, squatters, tenants, etc) for the Enhancement of Intra State Transmission System of Assam Project and agrees to provide resettlement and rehabilitation assistance including cost of buildings (as per current BSR of the District/State – the value of time invested in constructed is subsumed in the BSR), shifting allowance, displacement allowance, subsistence grant, etc at par with titleholders in accordance with the Second Schedule of the RFCTLARR Act, 2013. Non-titleholders (encroachers, squatters, tenants) will not be eligible for compensation of land encroached upon or occupied without authority or squatted upon for whatever purpose(s).
Resettlement of	The Act also provides rehabilitation and resettlement entitlements to families whose	PAP is entitled to cash compensation for any improvements made on the land e.g. irrigation,	The replacement cost of improvements (irrigation

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
informal users of agricultural land	livelihood is primarily dependent on land acquired. The rehabilitation and settlement entitlements include the following: (i) onetime payment of Rs. 5 lakhs to restore their livelihood and living standard; (ii) subsistence grant @ Rs. 3000/- per month for 12 months to each displaced family; (iii) one time resettlement allowance of Rs. 50000/- for each affected family. The value of perennial crops shall be determined by the concerned department as the standard process followed.	drainage, perennial crops, objects etc. at replacement cost, and support after displacement for a transition period to restore livelihood.	channel, drainage, etc) made on the land shall be estimated without depreciation as per the method followed by the concerned department (Irrigation or Water Resources Department) based on the current year rate.
Resettlement of the lessee of agricultural land	The Act also provides rehabilitation and resettlement entitlements to families whose livelihood is primarily dependent on land acquired. The rehabilitation and resettlement entitlements include the following: (i) onetime payment of Rs. 5 lakhs to restore their livelihood and living standard; (ii) subsistence grant @ Rs. 3000/- per month for 12 months to each displaced family; (iii) one time resettlement allowance of Rs. 50000/- for each affected family. The value of perennial crops shall be determined by the concerned department as the standard process followed.	PAP is entitled to cash compensation for any improvements made on the land i.e. Irrigation, drainage, perennial crops, objects etc. at replacement cost, assistance in provision of lease to corresponding public owned property for an equivalent period of time (if applicable), and support after displacement for a transition period to restore livelihood.	The lease amount for the remaining period of the lease agreement shall be deducted from the compensation amount of land to be paid to the landowner and the same will be paid to the lessee.
Annual crops owner or lessee	The Act provides for assessing the value of the standing crops damaged during the process of land acquisition. The value of crops shall be determined by taking the services of experienced persons in the field of agriculture as may be considered necessary.	PAP is entitled to compensation for lost crops at full replacement cost, including all not harvested crops.	Both AIIB and GoI norms insist on entitled to compensation for lost crops at full replacement cost, including all not harvested crops.
(Tea) Plantations	The compensation of the damage is governed by	PAP is entitled to compensation at replacement cost for the tea plantation including the net	As per GoI norms compensation is paid as per assessment done by revenue department, which is

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
	the Electricity Act, 2003 and the Indian Telegraph Act, 1885. The compensation towards the damage is provided without the acquisition of land which are assessed/reviewed by the Revenue Authorities.	value of the production lost during the period it takes to restore the productivity of the plantation, and any investments (seedlings, treatment of land etc.) and labour needed for growing plantation.	the net value of production loss Including shade trees and tree bushes. AIIB guidelines suggest additional support with regards to seedlings, treatment of land and labour needs.
(Tea) Plantations not yet yielding (owner, lessee, informal owner)	The compensation of the damage is governed by the Electricity Act, 2003 and the Indian Telegraph Act, 1885. The compensation towards the damage are provided without the acquisition of land which are assessed/reviewed by the Revenue Authorities.	PAP is entitled to compensation at replacement cost for the plantation including the net value of the production lost during the period it takes to restore the plantation, and any investments (seedlings, treatment of land etc.) and labour needed for growing the plantation	As per GoI norms compensation is paid as per assessment done by revenue department. AIIB guidelines suggest additional support with regards to seedlings, treatment of land and labour needs.
Business property	The Act has provision for determining the market value of the building and other immovable property or assets attached to the land or building which are to be acquired. The services of a competent engineer or any other specialist in the relevant field shall be used for the same. The market value of the business property shall be estimated based on current year BSR without depreciation.	Option 1. Cash compensation at replacement cost, loss of income and moving allowance Option 2. Alternative property with adequate tenure arrangements, full relocation cost, including the inventory, and the replacement cost for any investment, transitional allowance, appropriate level of support for skill upgrading training, if necessary, to restore livelihood.	The route alignment for transmission lines are selected to avoid any damage to permanent structure or temporary structure. AEGCL will ensure the compensation against damage to any business property in case of damage as per law of land, which is in coherence with AIIB policy.
Loss of benefits and income for workers and employees	The Act does not cover workers and employees who will experience loss of income.	Targeted assistance and opportunities to restore, and where possible improve, income-earning capacity, production levels and standards of living.	AEGCL recognizes the existence of workers and employees whose livelihood will be disrupted due to the implementation of the proposed project. Workers and employees engaged with the business enterprise, industrial units, and others shall be identified and considered for rehabilitation and resettlement assistance including livelihood training at project cost.
Loss of civic infrastructure and community services.	The Act has the provision of Infrastructural Amenities. Infrastructural facilities and basic minimum amenities shall be provided at the cost of the Requisitioning Authority at the	Assistance should be provided that will offset any loss of a civic infrastructure and community services. Identification of institutions tasked with setting up and	The proposed project is not likely to have any large-scale involuntary resettlement leading to development of a new resettlement site/colony. However, common property resources are likely to

Subject	National Regulations	AIIB ESS 2	Measures to bridge gaps
	resettlement site/colony.	maintaining specific public amenities and consult local communities on how to replace them. These provisions shall be specified in the RP.	be affected due to the implementation of the project. AEGCL will replace or reconstruct or provide an alternate common property resource affected in consultation with the local community at project cost.
Grievance mechanism and dispute resolution	The Act mandates the establishment of land acquisition, rehabilitation and resettlement authority for the purpose of providing speedy disposal of disputes relating to land acquisition, compensation, and rehabilitation and resettlement.	Accessible and appropriate grievance mechanism must be enabled for PAPs and local communities at the whole period of project implementation.	A multi-tier GRM (at sub-project and Project level) shall be constituted prior to the start of the project works to resolve as many grievances as possible using an understandable and transparent process that is gender-responsive, culturally appropriate, and readily accessible at no costs and without retribution.
Monitoring of resettlement implementation	The formulation, execution and monitoring of the Rehabilitation and Resettlement Schemes shall vest in the Administrator who will work as per directions and control of the Commissioner for Rehabilitation and Resettlement. Further, the Act provides for establishing National Monitoring Committee & State Monitoring Committee for reviewing and monitoring the implementation of rehabilitation and resettlement schemes or plans under this Act.	PIU is responsible for appropriate monitoring of the activities, which were defined in this RPF and RPs.	Project level internal monitoring of RAP implementation will be carried out by PMU/PIU/ESC of AEGCL and PMC. Evaluation of RAP implementation will be conducted by an external agency to be engaged by AEGCL.
Vulnerable groups	Act governing land acquisition (Second Schedule) provides additional assistance to SC and ST families displaced from Scheduled Areas only which is Rs. 50000/-. This one-time financial assistance is in addition to the rehabilitation and resettlement as per the second schedule.	According to the ESS2, special attention must be given to vulnerable groups. They are entitled to additional compensation, legal assistance during resettlement and help during physical relocation. As well, these PAPs are given a priority of employment.	AEGCL recognizes vulnerable groups. The ESMP Framework for the proposed project has been covered under the “Objectives of the resettlement planning framework”. It includes STs residing in scheduled areas, physically handicapped HoH, disabled families, Women headed families, etc. Special assistance of Rs. 25,000/- shall be paid to vulnerable households.

10.5 The process of Land Acquisition as per GoI/GoA Regulations

Applicability: *Transmission projects which involve the construction of substations and involve acquisition of land*

Land is required for construction of substations and erecting transmission and distribution towers. Land secured for construction of substations is no longer accessible to the existing owner and hence in such cases ownership is transferred from the existing owner to the respective utility. *However, ownership of land used for erecting towers remains with the existing land owner and the utility only receives rights to use the land.* Therefore, when we talk of loss of land, it refers to land secured for substation construction.

If a sub-project requires acquisition of land or asset, necessary measure should be taken to ensure that the affected persons are:

- Informed about their options and rights pertaining to resettlement;
- Consulted on, offered choices among, and provided with technically and economically feasible resettlement alternatives;
- Provided prompt and effective compensation at full replacement cost for losses of assets attributable directly to the project.

If the impacts include physical relocation, the RP or RPF includes measures to ensure that the displaced persons are:

- Provided assistance (such as moving allowances) during relocation; and
- Provided with residential housing, or housing sites, or, as required, agricultural sites for which a combination of productive potential, locational advantages, and other factors is at least equivalent to the advantages of the old site.

Where necessary to achieve the objectives of the policy, the RP or RPF also include measures to ensure that displaced persons are:

- Offered support after displacement, for a transition period, based on a reasonable estimate of the time likely to be needed to restore their livelihood and standards of living;
- Provided with development assistance in addition to compensation measures such as land preparation, credit facilities, training, or job opportunities.

Depending on extent of land requirement for sub-project, the nature of acquiring land for substation subprojects could be through the following three processes: Transfer of voluntary donation, purchase of land on negotiated price, involuntary acquisition of land. The pre-requisites to sub-project finalization and acquisition of land which should be followed by the concerned authorities are:

- Land record has been correctly updated in revenue record as well as cadastral maps by the concerned authorities
- The land and asset acquisition have been done in accordance to the regulation GoI, GoA and AIIB policies.
- Ensuring that the land and asset acquisition has been done in legal, documented and transparent manner. The documents pertaining to transfer of land, consents from owners should be properly documented and published in public domain.
- All grievances especially related to the land acquisition must be registered, recorded and informed to AIIB along with the redress process followed for them.

10.5.1 Voluntary donation

In case of voluntary donation of land, the following shall be ensured:

- The land user(s) will not be subjected to undue pressure for parting of land;
- Ensure that the land owner has the capacity to voluntarily donate land. In other words, land donation will be not accepted from land owners whose land holding is less than the minimum economical land holding size (2.5 acres).
- Voluntary donation shall not be more than 10% of the total land holding.
- The donation will not cause any economical or physical displacement of the current land users.
- All out efforts shall be made to avoid any physical relocation/displacement due to loss of land;
- The land in question must be free of squatters, encroachers, or other claims or encumbrances.
- The AEGCL shall facilitate in extending 'gratitude' to the land donor(s) in lieu of the 'contribution' if so agreed. The same shall be documented in the shape of MoU between donor and utility and subsequently title of land transferred in the name of AEGCL
- All land donations (as well as purchases) will be subject to a review/ approval from a committee comprising representatives of different sections including those from the IA and Government of Assam.

10.5.2 Purchase of land on willing buyer and willing seller basis on negotiated price

When land is purchased from a willing seller, the utility shall ensure:

- Consultation with the affected person has to be carried out and documented.
- All negotiations have to be carried out in a transparent manner.
- That land owners are aware of the basis on which compensation is calculated.
- In case of procurement of land through private purchase, AEGCL shall ensure that compensation/rate for land is not less than the rate provided in the new land acquisition act, 2013 and the Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015.
- The finalization of land price/negotiation shall be through a committee.
- In order to comply with this provision AEGCL may organize an awareness camp where provisions of new act in respect of basis/modalities of compensation calculation shall be explained to land owners with specific State provision if any.

10.5.3 Involuntary acquisition of land

In order to avoid the loss of private / community lands or agriculture and forest lands, the transmission and distribution utilities will endeavour, wherever possible, to secure Government land for their projects and avoid private or community lands, even if this requires realignment of the proposed route. Only in rare cases when Government land is not available, other methods of securing land (as listed above) will be pursued. Involuntary acquisition of land will be the last resort and be undertaken when other methods are not feasible. In the case of involuntary acquisition, the provisions of RFCTLARR Act, 2013 and The Assam RFCTLARR Rules, 2015 will be applicable.

The RFCTLARRA, 2013 authorizes the state Government, i.e. the Government of Assam, its authorized Government agency to complete the whole process of acquisition of private land including Social Impact Assessment (SIA), Action Plan for R&R (i.e. Rehabilitation and Resettlement) & its implementation. AEGCL's responsibility is limited to identification and selection of suitable land based on technical requirement and ensuring budget allocation.

As per RFCTLARR Act, the appropriate government shall ensure that a Social Impact Assessment study is carried out in consultation with the concerned Panchayat, Municipality or Municipal Corporation in the affected area and hold public hearings in the process. Further, the Appropriate Government will ensure minimum displacement of people, minimum disturbance to the infrastructure, ecology and minimum adverse impact on the individuals affected. For this, the Appropriate Government shall ensure that:

- There is a legitimate and bona fide public purpose which necessitates the acquisition.
- The potential benefits and the public purpose shall outweigh the social costs and adverse social impact as determined by the Social Impact Assessment.
- Only the minimum area of land required for projects is to be acquired.
- There is no unutilized land which has been previously acquired in the area. Any land acquired earlier and remaining unutilized is used for the purpose.
- Also, as far as possible no acquisition of land shall be made in Scheduled Areas. Where this is done, it shall be only as a demonstrable last resort and with the prior consent of the concerned Gram Sabha or the Panchayats.

The process under the 2013 land acquisition act is provided below:

- On confirmation of the scheme and finalization of land after exploring alternative site, AEGCL would submit a proposal for acquisition of private selected land detailing the extent of land and its exact location. After due process of approval, the government shall notify the affected area where selected land is situated for conducting detailed social assessment.
- A detailed Social Impact Assessment (SIA) studies shall be undertaken by an Independent Agency/Institution on a project specific TOR. The SIA agency shall first consult the concerned Panchayat, Municipality, District/Village Council at village level or ward level in the affected area to carry out SIA study. SIA shall assess the purpose of acquisition and estimate the affected families, gender, social group carry out analysis regarding impact on community properties, assets and infrastructure particularly roads, public transport, drainage, sanitation, sources of drinking water, sources of water for cattle, community ponds grazing land, plantations, public utilities electricity supply and health care facilities. The SIA agency shall also prepare a Social Impact Management Plan (SIMP) listing ameliorative measures required for addressing the likely impact visà-vis intended benefit of the project. The SIA report and SIMP shall be subject to public hearing in the affected area after giving adequate publicity for the venue, time etc. to ascertain the views of affected families/communities which shall be included in the SIA.
- The final SIA report shall be published including its translation in local language and shall also be made available to Panchayats, District/Village Councils & Deputy Collector/District Magistrate office for wider circulation. Explicit consent will be required in the case of lands in respect of tribal areas from ADC and the Village Councils.
- The flow chart of the land acquisition process with schedule prescribed for various activities is given in **Figure 26**.

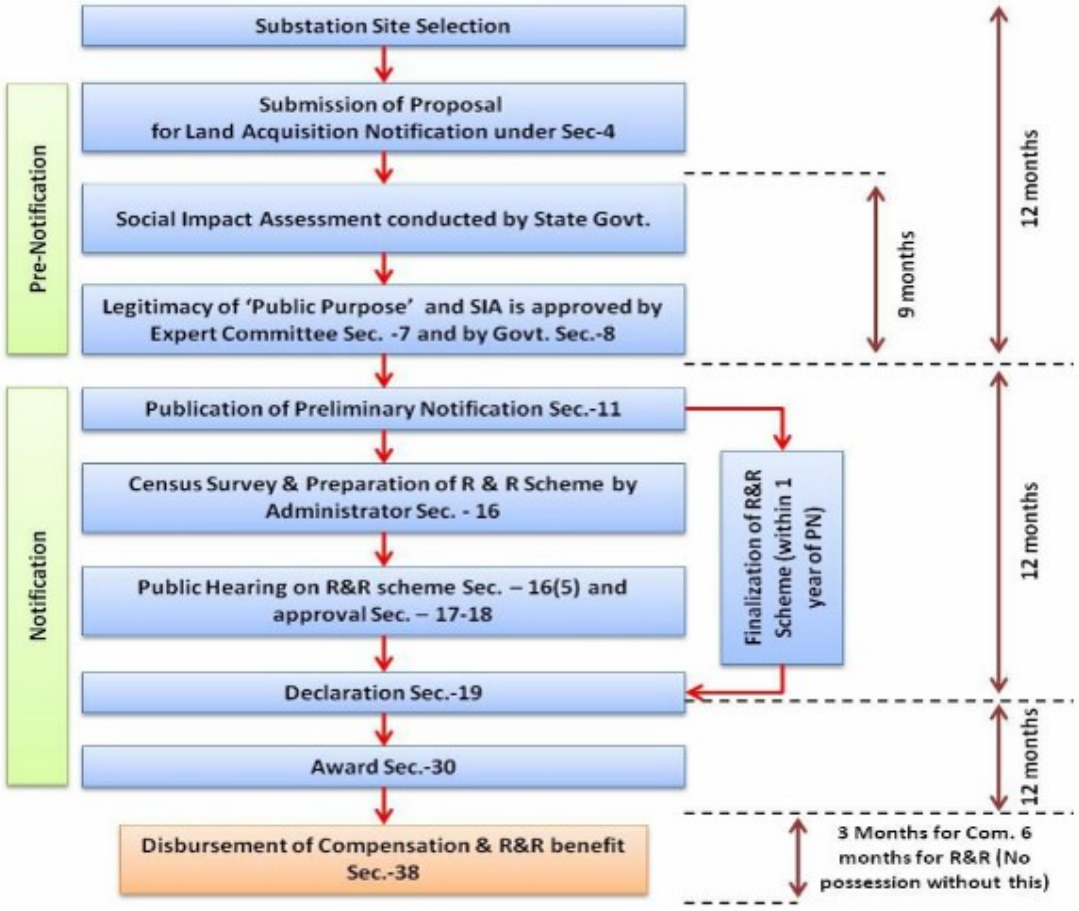


Figure 26: The process of land acquisition as per RFCTLARRA, 2013

Compensation and rehabilitation settlement:

- Based on the SIMP, the Collector shall discuss the Package in a meeting with the Rehabilitation and Resettlement committee at project level and submit the Package to Commissioner Rehabilitation and Resettlement along with his/ her remarks.
- The Commissioner Rehabilitation and Resettlement shall, after due vetting, accords approval to the scheme and make it available in public domain.
- After approval of R & R plan by Commissioner R&R, the Collector shall issue two awards - one for land compensation based on procedures described in act & State's rules; and second for R&R as per approved social impact management plan.
- The Collector shall take possession of land after ensuring that full payment of compensation as well as rehabilitation and resettlement entitlements are paid or tendered to the entitled persons within a period of three months for the compensation and a period of six months for the monetary part of rehabilitation and resettlement entitlements as approved and commencing from the date of the award.
- The Collector shall be responsible for ensuring that the rehabilitation and resettlement process is completed in all its aspects before displacing the affected families.
- The Collector shall, as far as possible. not displace any family which has already been displaced by the appropriate Government for the purpose of acquisition under the provisions of this Act, and if so displaced, shall pay an additional compensation equivalent to that of the compensation determined under this Act for the second or successive displacements.

10.5.4 Temporary restrictions to land use due to RoW

Applicability: *Transmission & Distribution Projects which involve laying of power lines and erection of towers u*nlike in the case of substations, for construction of transmission towers / distribution poles and laying of power lines, ownership of the land remains with the existing owner and is not transferred to the requesting body. ***The Electricity Act 2003 provides the utilities with powers under the Telegraph Act 1885 which in turn states that states that land for the lines and poles (towers) will not be acquired.*** The utility will have the right of user only in the property under, over, along, across in or upon which the lines and poles / towers are placed.

However, the Act allows the utilities to from time to time, place and maintain transmission / distribution lines under, over, along, or across, and towers / poles in or upon any immovable property. Further, the utility may at any time for the purpose of examining, repairing, altering or removing any transmission / distribution line or tower, enter on the property under, over, along, across, in or upon which the line or tower / pole has been placed.

In addition, the MoEF provides guidelines for maintaining a Right of Way (RoW) corridor which shall be kept clear of any obstruction. The RoW width depends upon the voltage of the line, for example, a 220Kv transmission line will have to maintain a clear RoW of 35 meters width whereas, a 132kV line will have to maintain 27 meters.

In a similar manner, tress in the RoW have to be cut or pruned to the extent required for preventing electrical hazards by maintaining the prescribed minimum clearances (from the lines). Therefore, while the ownership of land used for towers and lines remains with the existing owners, the construction of towers and laying of lines could lead to damage of crops or trees on the land. Further, the construction of the tower may restrict the use of land under the tower footing. Similarly, use of the land in the RoW corridor may also be restricted.

Most of the impacts are temporary in nature in terms of loss of standing crops/trees and other damages for which compensation will be paid to the affected persons/ community for all damages including cost of land for tower base and RoW corridor to its owner without acquiring it asper the Ministry of Power (MoP) guidelines, and Assam has already adopted MoP guidelines for land compensation vide notification dated 10.03.2017. Regarding this, compensation is made for the following:

- land cost of tower footings;
- Land compensation within the RoW of transmission Line
- standing crops;
- trees, if any;
- other assets like well and
- any other damages/ effects.

The alternative analysis conducted by AEGCL to shortlist the most feasible transmission line route needs to include the parameter of social assessment, along with environmental. The process of understanding and calculating the compensation for temporary damages may be carried with the alternative analysis.

The process is given below:

- A Social (and Environmental) Assessment is conducted in respect of each of the chosen lines of alignment. The process involved extensive consultations with land owners/farmers and different stakeholders.
- During the process public views and necessary inputs about surroundings/ villages/crops etc. are also necessary and noted for screening/scoping. After comparison and analysis of the environmental and social parameters gathered for all alternatives, and considering other significant economic benefit associated with the project/subproject, the most optimum route having the minimum environment & social impact is selected for further investigation.
- Site office will consult with state forest department if the line is passing through forest areas. Revenue authorities will be consulted for their views on revenue/other lands. Experts' assistance will be taken, as appropriate, on valuing crops, trees and other assets.
- Social Assessment concludes with: (i) selection of an optimum line; and (ii) a Social Management Plan viz., assessment of temporary damages and compensation. All these are disclosed widely among the stakeholders as well as on the internet and evince feedback. Due approval will be sought from District/ Village Councils. In case the scheme/project is implemented in predominantly tribal area a separate and comprehensive analysis in respect of likely impact both positive and negative shall be carried out and will be incorporated in the entitlement matrix or under a whole indigenous development plan.
- In cases of areas under the District Council/ Village Council in tribal areas, where official land records don't exist, formal land/property boundaries of private property owned by the tribal households can be determined through the process of community consultation and discussion with village head and village council members. Based on such information, land can be classified, and land record can be updated and compensation assessment can be made.
- In the states where the district council is under operation, although the land is notified from the district collector's/ deputy commissioner's office, the verification of ownership is done by the district/village council in consultation with the village people and assessment of compensation also done by the revenue officials based in the district council. After determination of ownership and compensation amount the same is sent to the district collector/ deputy commissioner.
- A notice under Indian Telegraph Act/Electricity Act, 2003 is served to the landowners informing that the proposed transmission line is being routed through the property of the individual concerned. The notice shall contain the particulars of the land, ownership details and the details of the trees/crops inevitability likely to be damaged during the course of the construction of the proposed transmission line and acknowledgement received from land owner.
- The revenue officer shall further issue a notice of intimation to the concerned landowner and inspect the site to verify the documents related to the proof of ownership and a detailed Mouza (village/erstwhile administrative land district) list is prepared for the identified trees and crops inevitability damaged during the course of the construction. For assessing the true value of timber yielding trees help of forest officials is taken and for fruit bearing trees help of Horticulture department is taken.
- The Mouza list shall contain the land owner details type of tree/crop, its present age, variety, yielding pattern etc. and the same is prepared at site in the presence of the land owner. These Mouza lists are further compiled and a random verification is conducted by the concerned District Collector or his authorized representative in order to ascertain the assessment carried out by the revenue office is genuine and correct. After this process the District collector issues a tree cutting permit to AEGCL to enable removal / damage to the standing tree/crop identified in the line corridor.

- Once the tree/crop is removed / damaged, AEGCL shall issue a tree cutting/crop damaged notice to the land owner with a copy to the Revenue Officer to process the compensation payment. The detailed Valuation statement is verified at various levels and approval of payment of compensation is accorded by the concerned District Collectors.
- On approval of compensation, the revenue officer shall further intimate the amount payable to the different landowners and AEGCL arranges the payment by way of Demand Draft to the affected parties.

10.5.5 Identification of persons, land plots and/or other property to be affected by temporary/permanent restriction of access for Project needs

The extent of impacts caused by the Project will be estimated during the detailed design stage. As information about design documents is currently unknown, the need for land acquisition and resettlement may occur in the future. If that turns out to be the case, PIU will prepare an RP in line with all applicable requirements and principles set herein.

The social impact assessment should use the following actions to assess affected persons and anticipated impacts:

- Desktop research to identify such features as population settlements, infrastructure, soil composition, natural vegetation areas, water resources, and land use patterns;
- a census that enumerates the affected people and registers them according to location;
- an inventory of lost and affected assets at the household, enterprise, and community level;
- socioeconomic surveys and studies of all affected people;
- analysis of surveys and studies to establish compensation parameters, to design appropriate income restoration and sustainable development initiatives, and to identify baseline monitoring indicators; and
- consultation with affected populations regarding mitigation of effects and development opportunities.

In case unregistered land users are affected, the PIU or relevant responsible authorities will assist the affected land users to register or update the registration of their lands in order to compensate them under this RPF.

The non-land assets/structures on the affected plots of land users without titles will be evaluated and compensated by exactly the same criteria as those with titles.

10.5.6 Persons eligible for compensation

According to this RPF, the following persons are entitled for compensation, if present in the Project area prior to cut-off date:

- PAPs who are formal owners or lessees, or legal users under the provisions of the GoI/A law, or unregistered owners and informal users of privately or publicly owned affected agricultural or construction land, or part of the land;
- PAPs who are owners and informal users of crops that are affected by the Project;
- PAPs who are owners and informal users of perennial plants and trees such as fruit bearing trees and plantations that are affected by the Project;
- PAPs who are owners and informal users, of affected plantations that have not given yield yet that are affected by the Project;
- PAPs who are owners and informal users, of any plant nursery which has not yield yet that are affected by the Project;

- PAPs who are owners of the affected non-agricultural business on the whole plot or a part of it that are affected by the Project;
- Workers, agricultural processors and farmers on affected property, whose incomes and livelihoods are temporarily affected due to Project's impact.
- Communities or households whose access to their buildings and usual economic, social or cultural resources are affected by the Project;
- PAPs who are formal owners, or lessees, or legal users under the provision of GoI/A law, or unregistered owners and informal users, and who are affected by the Project because of the temporarily occupation of their land;
- Vulnerable groups, persons below the poverty line in accordance with national laws, members of STs, women led households, single parents, elderly, disabled persons or those with long-term health problems which are affected by the Project;
- PAPs who are formal or informal owners (building constructed without building permit on one's own land plot, or someone else's or state-owned plot) or lessees of the building (residential, commercial, industrial, institutional, auxiliary, etc.), or persons with occupancy rights on flats in expropriated residential building or apartment, or a part of the building that is affected by the Project, or informal users of public buildings; and
- PAP's whose losses cannot be determined or foreseen at this stage of the Project.

10.5.7 Evaluation of affected assets

Some general rules shall apply when evaluating assets for compensation:

Compensations for buildings and land: Compensation for agricultural land, an expropriated building or land can be another appropriate replacement property, which corresponds in value, quality, accessibility, etc. If there is a difference of values at replacement cost between expropriated and offered property, the PIU and property owner can agree on additional cash payment to bridge the gap. Cash compensation at replacement cost (including all associated costs of transaction, for example, registration costs in land/cadastral registries, transfer and administrative fees, if any), will be provided for land and buildings. The compensation will also be provided for all possible damages caused by any construction activities.

Compensation for crops and trees: During the expropriation, it is preferable to comply with the rule that access to site is performed only after all remaining annual crops are collected, whenever possible. For annual crops harvested before access to site the compensation will not be paid. Annual crops that cannot be harvested prior to access to site the compensation shall be provided at replacement costs. The PAP shall have the choice to harvest the crops even after the access to site by PIU, if possible. Compensation for perennial plants and trees will be ensured at a replacement cost. Determining full replacement cost requires consideration not only of yield, but also of costs of setting up the plantation from the start (seedlings, ground preparation etc.), as well as income lost during the period necessary to achieve yield again.

Compensation for other losses: If the project activities result in loss or resettlement of livelihood sources (for example beehives), such persons will be compensated for a loss of production of one season plus reasonable costs in relation to relocating production resources.

10.6 Entitlement Matrix

An Entitlement Matrix envisages all affected households and persons losing assets and livelihood and defines the entitlement of compensation and resettlement assistance depending on the nature of ownership rights on lost assets and extent of the impacts including socio-economic vulnerability of the displaced persons.

The Entitlement Matrix, summarizing all possible types of losses and corresponding nature and scope of entitlements, in accordance with the principles of this Resettlement Planning Framework, is presented in

Table 47 APs will be entitled to a combination of compensation measures and resettlement assistance, depending on the nature of ownership rights of lost assets and scope of the impact, including social and economic vulnerability of the APs.

Table 47: Entitlement Matrix

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
A. Permanent Land acquisition				
1.	Loss of private land	Agricultural land, vacant plot, of homestead land	Legal titleholders/ APs with customary land right/APs with Permit from local authority	• Compensation at replacement value or land for land where feasible. Determination of compensation will be as follows: **<u>1. Market value of the land</u>** -as specified in the Indian Stamp Act, 1899 Or -the average of the sale price for similar type of land situated in the village or vicinity, Or -consented amount of compensation as agreed in case of acquisition of lands for private companies or for public private partnership project. whichever is higher **Market value x Multiplier as applicable**: The multiplication factor for land acquisition compensation shall be determined by the distance of the acquired land from the nearest urban area. The factors are as follows: • Up to 10 KM: 1.2 • From 10 to 20 KM: 1.4 • From 20 to 30 KM: 1.6 • From 30 to 40 KM: 1.8 • From 40 Km and above: 2.0 **2. Value of the assets attached to land:** Building/Trees/Wells/Crop etc. as valued by relevant govt. authority; **Land compensation = 1+2** **3. Solatium: 100% of total land compensation** **Total Compensation= 1+2+3** • One-time Resettlement allowance of Rs. 50,000 per affected family • One-time assistance option from: (i) Job for at least one member of the displaced family in project which has created impact or in similar such other project; or (ii) One-time payment of INR 5,00,000 per displaced family.

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
				• All displaced families will receive (i) monthly Subsistence allowance of Rs. 3,000 for one year from the date of award, and (ii) SC/ST households will receive additional onetime payment of INR 50,000/- • 60 days advance notice to harvest standing seasonal crops prior to damage. If notice cannot be given, compensation for share of crops will be provided. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to compensation (registration, stamp fees, etc.)
			Tenants and leaseholders (whether having written tenancy / lease documents or not)/share croppers	• Compensation for rental deposit or unexpired lease. • Share of the crop loss between owners and sharecroppers / tenants / lease holders as per the agreement (50% of crop) • All displaced families will receive (i) monthly subsistence allowance of Rs. 3,000 for one year from the date of award, and (ii) SC/ST households will receive additional onetime payment of Rs. 50,000. • 60 days advance notice to harvest standing seasonal crops prior to damage. If notice cannot be given, compensation for share of crops will be provided. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to compensation
2.	Loss of Government land	Vacant plot, agricultural land and homestead land	Leaseholders	• Reimbursement of unexpired lease. • All displaced families will receive (i) monthly Subsistence allowance of Rs. 3,000 for one year from the date of award, and (ii) SC/ST households will receive additional onetime payment of Rs. 50,000. • 60 days advance notice to harvest standing seasonal crops prior to damage. If notice cannot be given, compensation for share of crops will be provided. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to compensation
			Squatters	• 60 days advance notice to shift from occupied land. • 60 days advance notice to harvest standing seasonal crops prior to damage. If notice cannot be given, compensation for share of crops will be provided. • All displaced families will receive (i) monthly Subsistence allowance of Rs. 3,000 for one

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
				year from the date of award, and (ii) SC/ST households will receive additional onetime payment of Rs. 50,000. • Additional compensation for vulnerable households.
			Encroachers	• 60 days advance notice to shift from encroached land. • Notice to harvest standing seasonal crops. If notice cannot be given, compensation for share of crops will be provided. • Additional compensation for vulnerable households.
3.	Loss of residential structure	Residential structure	Legal Titleholders	• Replacement value of the structure and other assets (or part of the structure and other assets, if remainder is viable). Compensation will be at replacement value excluding depreciation (part of land compensation in S. No. 1 of the entitlement matrix) • If house lost in rural areas, constructed house as per Indira Awas Yojana specifications. If in urban area, house of minimum 50 sq. m. plinth area. This benefit should be extended irrespective of title if the affected family is residing in affected area for continuously at least for three years prior to issue of notification. In either case the equivalent cost of the house may also be provided in lieu of the house as per the preference of the PAP. • One-time Resettlement allowance of Rs. 50,000 per affected household • Subsistence/grant allowance for displaced families of Rs 3000 per month for 12 months • All physically displaced families will receive both: (i) One-time Shifting assistance of Rs. 50,000 towards transport costs etc.; and (ii) monthly Subsistence allowance of Rs. 3,000 for one year from the date of award, and (iii) SC/ST households will receive additional onetime payment of Rs. 50,000. • Each affected family having cattle shed shall get one- time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of Rs. 25,000 for construction of cattle shed • Right to salvage materials from structure and other assets with no deductions from replacement value. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
				compensation
			Tenants and Leaseholders	• Replacement value of the structure and other assets (or part of the structure and other assets, if remainder is viable). Compensation will be at replacement value excluding depreciation Compensation for rental deposit or unexpired lease. • Right to salvage materials (of the portion constructed by tenants or leaseholders) from structure and other assets • One-time Resettlement allowance of Rs. 50,000 per affected family • All displaced families will receive both: (i) One time Shifting assistance of Rs. 50,000 towards transport costs etc.; and (ii) monthly Subsistence allowance of Rs. 3,000 for one year from the date of award, (iii) SC/ST households will receive additional onetime payment of Rs. 50,000 • Each affected family having cattle shed shall get one- time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of Rs. 25,000 for construction of cattle shed • Right to salvage materials from structure and other assets with no deductions from replacement value. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to compensation.
			Squatters	• Replacement value of the structure and other assets (or part of the structure and other assets, if remainder is viable). Compensation will be at replacement value excluding depreciation • Right to salvage materials from structure and other assets • One-time Resettlement allowance of Rs. 50,000 per affected family • All displaced families will receive both: (i) One time Shifting assistance of Rs. 50,000 towards transport costs etc.; and (ii) monthly Subsistence allowance of Rs. 3,000 for one year from the date of award. SC/ST households will receive additional onetime payment of Rs. 50,000 • Each affected family having cattle shed shall get one- time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of Rs. 25,000 for construction of cattle shed

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
				• Right to salvage materials from structure and other assets • Additional compensation for vulnerable households.
			Encroachers	• 60 days advance notice to shift from encroached structure. • Right to salvage materials from structure and other assets • Additional compensation for vulnerable households.
4.	Loss of commercial a structure	Commercial structure	Legal titleholders	• Reconstruction cost (without depreciation) for lost frontage/structure; affected person shall be allowed to take salvaged material from the demolished structure at no costs. • Each affected family having petty shop shall get one- time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of Rs. 25,000 for construction of petty shop • Right to salvage materials from structure and other assets with no deductions from replacement value. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to compensation
			Tenants and leaseholders	• Replacement cost of part/whole of structure constructed by the tenant/leaseholder, and this will be deducted from the compensation amount of the total structure. Compensation will be at replacement value excluding depreciation. • Compensation for rental deposit or unexpired lease. • One-time Resettlement allowance of Rs. 50,000 per affected family • Each affected family having petty shop shall get one- time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of Rs. 25,000 for construction of petty shop • Right to salvage materials from structure and other assets with no deductions from replacement value. • Additional compensation for vulnerable households. • Exemption from fees and taxes related to compensation
			Squatters	• Replacement cost of structure constructed by the squatter. Compensation will be at replacement value excluding depreciation

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
				• One-time Resettlement allowance of Rs. 50,000 per affected family • Each affected family having petty shop shall get one- time financial assistance of such amount as the appropriate Government may, by notification, specify subject to a minimum of Rs. 25,000 for construction of petty shop • Right to salvage materials from structure and other assets. • Additional compensation for vulnerable households.
			Encroachers	• 60 days advance notice to shift from encroached structure. • Right to salvage materials from structure and other assets • Additional compensation for vulnerable households.
5.	Loss of livelihood	Livelihood	Legal titleholder/ tenant/lease holder/non-titled/employee of commercial structure, farmer/ agricultural worker/artisan/ small trader/ self employed	• One-time financial assistance of minimum Rs. 25,000 or as decided by the appropriate government, whichever is higher. • Income restoration and training to eligible APs • Additional compensation for vulnerable households. • Consideration for project employment.
6.	Loss of trees and crops	Standing trees and crops	Legal titleholder/ tenant/lease holder/share cropper/non-titled AP	• 60 days advance notice to harvest standing seasonal crops prior to damage, fruits, and timber. • Compensation to actual cultivator at market rate for crops and 8 years income for fruit bearing trees*. • Compensation for trees based on timber value at market price. • All timber* will be allowed to retain by the owner.
7.	Impacts on vulnerable APs	All impacts	Vulnerable APs	• One-time lump sum assistance of Rs. 25,000 to vulnerable households. This will be paid above and over the other assistance. • Vulnerable APs will receive preferential income restoration training program under the Project. • Consideration for project employment. • Vulnerable PAPs include STs residing in scheduled areas/ physically handicapped HoH/ disabled families, Women headed families, etc.
B. Temporary Loss of Land / Restriction in use of land (Transmission line)				
1.	Temporary loss of land/	Land temporarily	Legal titleholders	**For land area below tower base#:** • 85% land cost at market value as

S.No.	Type of Loss	Application	Definition of entitled persons	Entitlement
	Restriction in use of land.	required for sub- project construction below tower base and for the RoW of the transmission line.		ascertained by revenue authorities or based on negotiated settlement without actual acquisition/title transfer. **For land coming in corridor of width of Right of Way#:** • Maximum of 15% of land cost as decided by Deputy Commissioner based on the circle rate/ guideline value/ Stamp Act rates • Restoration of land to previous or better quality
2.	Loss/damage to crops and trees in line corridor.	Loss/damage to crops and trees in line corridor.	Legal titleholder / Non-titleholder APs	• 60 days' notice to harvest standing crops • If notice cannot be given the, compensation to actual cultivator at market rate for crops and 8 years income for fruit bearing trees. • Restoration of land to previous or better quality • Compensation for actual damages (as assessed by concerned authority)
3.	Loss of structure	(i)House	Legal Titleholders	House Cash compensation at replacement cost (without deduction for recovered material and depreciation value + Rs. 25,000/- assistance (based on prevailing GOI norms for weaker section housing) for construction of house + transition benefits as given below.
		(ii) Shop/ Institutions/ Cattle shed	Individual/ Legal Titleholders	• Cash compensation at replacement cost. • Plus Rs. 10000/- for construction of working shed/shop plus transition benefits.
	Losses during transition	under (i) & (ii) above for Shifting / Transport	Family/unit	Provision of transport or equivalent cash for shifting of material/ cattle from existing place to alternate place
		Tribal/ Vulnerable	Tribal Aps / Vulnerable APs	One-time additional lump sum assistance not exceeding 25% of total compensation on recommendation of State Authority/ADC/VC.
4.	Loss of common resources	Common resources	Communities	Replacement or restoration of the affected community facilities – including public water stand posts, public utility posts, temples, shrines, etc. All community facility and utility replacement are compensated and also re-built following the principles of this RPF.
5.	Other damages (if applicable)		All APs	Unanticipated involuntary impacts will be documented and mitigated based on the principles of the Resettlement Framework.

10.7 Preparation of Individual RP (Resettlement Plan)

10.7.1 Individual RAP development, approval and implementation

Based on this RPF, if expropriation and resettlement is needed, A/RPs will be prepared. The objective of any A/RPs shall be to specify what procedures to follow and what actions to take to properly acquire land and compensate affected people by allowing and providing for adequate participation, consultation and full functioning of the grievance mechanism. Any site-specific A/RP shall be based on up-to-date and reliable information about (a) the proposed resettlement and its impacts on the displaced persons and other adversely affected groups, and (b) the legal issues involved in resettlement.

Irrespective of the complexity of project circumstances any site-specific A/RP shall include at minimum the following:

- Description of the project and identification of the project area,
- Identification of project activities that give rise to resettlement,
- Analysis of alternatives to avoid or minimize resettlement and conduct meaningful consultations with affected people about acceptable alternatives,
- Established mechanisms to minimize resettlement, to the extent possible, during project implementation,
- Comprehensive socioeconomic studies including:
  - census survey covering current occupants of the affected area to establish a basis for the design of the resettlement program and to exclude subsequent inflows of people from eligibility for compensation and resettlement assistance,
  - standard characteristics of displaced households, including a description of production systems, labor, and household organization; and
  - baseline information on livelihoods (including, as relevant, production levels and income derived from both formal and informal economic activities) and standards of living (including health status) of the displaced population, vulnerable groups or persons, legal framework.
- Analysis of legal framework, covering gaps, if any, between local laws covering eminent domain and resettlement and ESS2, and the mechanisms to bridge such gaps,
- Established institutional framework, institutional responsibility for implementation, eligibility, valuation of and compensation for losses and the methodology to be used in valuing losses,
- Established grievance procedures, implementation arrangements, monitoring and evaluation and cost and budget.

10.7.2 Objectives of the A/RP

- To minimize possible adverse impacts of resettlement on population and property,
- To mitigate adverse social and economic impacts of expropriation and temporary or permanent losses by providing compensation for losses of property on the basis of replacement costs and ensure implementation of the activities of resettlement with appropriate data disclosure, consultations and participation of PAPs;
- To re-establish or improve, where possible, sources of income and living standards of resettled persons on the level before Project impact,
- To establish organizational systems and procedures for monitoring the realization of RP and to take corrective measures.

It is necessary to carry out a socio-economic census in order to identify the following:

- Current beneficiaries of the area in the scope of the Project, in order to establish baseline for creating the resettlement program and to avoid opportunistic claims,

- Standard characteristics of affected households, including description of production system, work and organization of household, with the basic information about livelihood (including, if relevant, level of production and income obtained from formal and informal economic activities) and standard of living (including health condition),
- Range of expected loss of property (total or partial) and range of resettlement, whether physical or economic,
- Information on vulnerable groups, particularly those below the poverty line, old and infirm persons, women and children, ethnic groups and other resettled persons not protected by Law of Expropriation, and for whom special measures must be taken,
- Measures for regular update of information on resettled persons and their livelihood and living standards, so that at the right moment, i.e. when the resettlement begins, the latest information is available. If updated information differs significantly from the original, measures will be defined how to record these changes and to update the resettlement program, in the way which is in accordance with the originally approved program.

A/RP will be submitted to AIIB for review and clearance. No activities on construction works can commence until and unless compensation has been paid, or appropriate budget set aside on an escrow account or account alike, or replacement property administered to PAPs, or court procedure initiated to determine the compensation in case no amicable settlement is reached.
Implementation of A/RP is an obligation of PMU, AEGCL shall monitor overall implementation, collaborate with its Electrical Circles in whose jurisdiction the works are taking place, collaborate with contractors and disclose information to PAPs and communities.

10.7.3 Public consultation in RP Preparation and Implementation.

Activities on the preparation of site-specific A/RP will be disclosed in the way to encourage meaningful participation of PAPs. That assumes the phase of preliminary preparations, disclosure of preparations for population census, disclosure of census results while respecting privacy of personal information, disclosure of social assessment, as well as disclosure of A/RP drafts. The purpose of public disclosure and discussions is to ensure meaningful participation of PAPs in the process of preparation, implementation and monitoring of AEGCL will adopt a pro-active approach, which involves public disclosure of all appropriate information about the preparation of the A/RP, meaningful consultation with PAPs and local communities and an effective procedure or mechanism by which people can make comments or raise grievances. As part of A/RP preparation, AEGCL will include following steps to ensure proper communication about key issues and full A/RP disclosure:

- define PAP engagement strategy in A/RP preparation, as part of overall planning of the Project;
- map specific issues (e.g. the definition of entitlements, surveys, census, specific engagement with vulnerable groups etc.) and PAP groups (e.g. owners of property, women, persons and businesses affected by economic displacement, tea plantation owners/employees etc.) to be communicated to define criteria for identifying and prioritizing and select an engagement mechanism;
- define clear internal and management roles, responsibilities and authority as well as designate specific personnel to be responsible for the implementation and monitoring of A/RP disclosure activity;
- provide with effective procedure by which PAPs can express grievances and comments about A/RP at all phases of its preparation, identify opportunities from feedback and determine actions, revisit goals and plan next steps for follow-up and future engagement;

- conduct the engagement itself, disclose information in a way appropriate for groups, type of loss and local circumstances, hold public consultation ensuring equitable PAP contribution and mitigating tension while remaining focused on the issues;
- after final A/RP has been adopted, in addition of appropriate full RP disclosure, prepare and make available to all affected persons and groups a summary document of the A/RP;

10.7.4 Project Affected Peoples' Mechanism (PPM) of AIIB

The PPM has been established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its Environmental and Social Policy in situations when their concerns cannot be addressed satisfactorily through a project-level GRM or AIIB Management's processes. Information on AIIB's PPM is available at: https://www.aiib.org/en/policies_strategies/operational-policies/policy_on-the-project-_affected-mechanism.html

Chapter – 11: Grievance Redressal Mechanism

Effective grievance redressal mechanism ensures good governance accountability and transparency in managing and mitigation of environmental and social issue of a particular project. The GRM is a free system that registers and attempts to resolve concerns or complaints by Project-affected people (PAPs) or construction workers. This process aims to quickly resolve disputes and avoid litigation, thus ensuring the smooth implementation of the project activities. As the Assam Intra-State Transmission System Enhancement Project (the Project) is funded by the Asian Infrastructure Investment Bank (AIIB), it complies with the Policy on the Project-affected People's Mechanism of the AIIB.

The power transmission project is not envisaged to involve the permanent acquisition of land and does not fall under Land Acquisition Act, 2013; hence the requirement stated under the Act such as GRM related to land acquisition will not be applicable for most of the sub-project locations. However, some of the substation locations will entail acquisition of private land where suitable government-owned land is not available. Thus, a multi-tiered GRM will be applicable to the project in its entirety. AEGCL does not have its in-house Environment or Social Safeguards Policy regarding transmission subprojects currently. To honour the GRM, AEGCL will adopt the practice to resolve any major/ minor grievances, where AEGCL shall accept, review and address issues or problems raised by PAPs and Project workers arising from Project-related works.

The primary objectives of GRM are:

- **Provide an accessible, transparent, efficient and predictable mechanism for resolution of grievances to all project by:**
  - Popularizing the GRM and how it can be accessed for free.
  - Receiving grievances in various possible forms (Written, Verbal, Electronic, Email, social media, Telephone, Fax, Suggestion Box)
- **Establishing clear procedures for redress that covers:**
  - Registration in the GRM log all grievances (including minor and verbal).
  - Acknowledgement to the complainant, explaining expected duration for resolution.
  - Investigation of the grievance, proposing a solution to the complainant and if acceptable closure of the complaint. OR
  - Escalation of the grievance from Tier I (field level)/ to Tier II (PMU level) which should be communicated to the complaint.
  - Investigation of the grievance, proposing a solution to the complainant
  - Provision of feedback and closure of the grievance in the GRM Log.
- **Complaint should be made aware that:**
  - There is no retribution or intimidation for complainants.
  - Access of the GRM is free for the complainants.
  - The GRM does not replace the judicial system.
  - Observe for any repeated complaints and inform PMU of such for their systemic resolution.
  - Providing an environment that fosters free and honest exchange of information, views, and ideas.

Constitutionof GrievanceRedressal Committee

For smooth functioning of GRM Tier I and Tier II Grievance redressal committee will be constitute, the Tier I committee will function at field level and Tier II at the PMU / HQ level**.**

Tier I Committee

1.	Deputy General Manager (Projects)	Chairman
2.	Sub District nominee Magistrate/District Revenue Officer or their nominee	Deputy-Chairman
3.	Assitan General manager of each Divisional office	Member
4.	Representative from the autonomous council districts in case of tribal districts	Member
5.	Representative of local Panchay at/Council	Member
6.	Women representative of village/council	Member
7.	Environmental and Social Specialist–PMU	Member
8.	Resident AEGCL Engineer	FocalPointofcontact
9.	Representative of EPC* contractor	FocalPointofcontact
10.	CBO/NGO representative TBD	Member

Tier II Committee

1.	Chief General Manager/Project Director	Chairman
2.	General Manager (EAP) HQ	Deputy-Chairman
3.	Stake Holder (from State Govt.)	Member
4.	Deputy General Manager (PMU -AEGCL)	Member
5.	Assitan General Manager (EAP, PMU – AEGCL)	Member
6.	Environmental and Social Specialist–PMU	Member
7.	Team Leader, PMC	Member
8.	E&S Experts, PMC	Member
9.	RepresentativeofEPCcontractor (Project Manager- level)	Member

Roles and Responsibilities of Grievance Redressal Committee:

- Receives grievance from complainant and record them in a logbook.
- Acknowledge receipt of complaints with a written record.
- Arrange for GRC meetings to consider the grievances.
- Work closely with the GRC members to develop and implementing actions to resolve grievances.
- Prepare minutes of GRC meetings and record solutions.
- Provide feedback information on the status of resolution to the complainant within assigned timeline.
- Review grievance response and submit to Contractor/PIU/PMU for approval or implementation.
- Submit proposed solutions to the complainant within assigned timeline.
- Ensure proper logging, escalation, tracking, reporting, and following up on all project specific grievances.
- Swiftly escalate any grievances that cannot be resolved at the project level or may pose a big reputational risk to the project. This includes any complaints related to the health, safety, dignity, and wellbeing of any person (both men and women).
- Notify PMU within 12 hours of any grievances that require investigation or intervention by the police or other relevant authorities.
- Provide monthly update to a member of the PMU who will track grievances and always include a section on grievance management in the monthly progress report.

Grievance Redressal Procedures:

The PMU shall formulate procedures for implementing the GRM and will take approval from the Bank. E&Sofficers of PMU and PMC shall undertake GRM's initiatives that include procedures of communicating the existence ofthe GRM, taking/ recording complaints, handling of on-the-spot resolution of minor problems, taking care ofcomplainants and provisions of responses to distressed stakeholders, escalating unresolved issues while paying particular attention to the impacts on vulnerable groups (**Figure 27** elaborates the procedures).

Environmental and social grievances shall be handled in accordance to the project's GRM. Open and transparent dialogue to be maintained with project-affected persons and project workers as and when needed, in compliance with ESP. The GRM for the project should provide an effective approach for complaints andresolution of issues made by the affected community and project workers in a reliable way. This mechanism shall remain active throughout the life cycle of the project. The proposed GRM does not replace the public mechanisms of complaint and conflict resolution envisaged by the legal system of the GoI but attempts to minimize use of it to the extent possible.

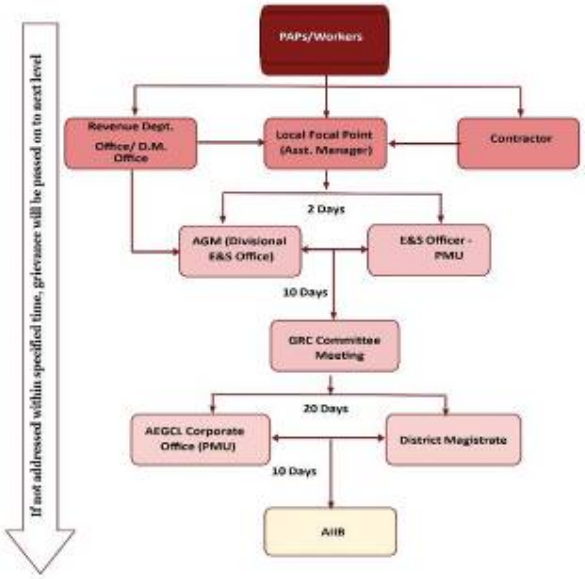


Figure 27: Grievance Redressal Process

Note:

1. The grievance redress mechanism is also applicable to the workers under contractors and sub-contractors. Grievances raised by workers and staff will be forwarded to the project engineers and management.

2. Any fatality should be informed to PMU and AIIB immediately.

Table 48: Most Common Grievances and possible Redressal:

Common Grievance Categories	Issues and Likely Solutions
Technical/ Engineering	➢ Design related – Suit the design to the site. Restrict the width according to the available land and modify the design accordingly ➢ Alignment related – Always use GPS coordinates. In case of problem contact Revenue department to correct the alignment ➢ Quality related – Get the materials and finished product tested at reputed laboratories

Common Grievance Categories	Issues and Likely Solutions
	and publicize the results
Environmental	➢ Storm water – Do not obstruct or divert natural drainage. Provide for culverts or bridges where necessary ➢ Stone blasting – Take precautions as per law and inform the communities accordingly ➢ Dust – Keep watering as required so that dust doesn't spread or rise. ➢ Noise – Use barriers at sensitive receptors and take up work at appropriate timings. ➢ Uncovered borrow areas – Dig barrow pits as per specifications. ➢ Waste Disposal – Dispose of waste at designated places only.
Social	➢ Disruption of other existing public services e.g. hospitals, schools, Water and electricity supply – Consult communities and minimize the disruption of service. Provide alternative supplies. ➢ Historical and Cultural sites – Follow the government guidelines on this. Do not deface any historical or cultural sites. ➢ HIV/AIDS/ Covid-19 issues – Follow the government SoP for these. Conduct awareness campaigns among the communities and workers. ➢ Child labour – Avoid child labour. No children below 14 years on work. No children below 18 years on hazardous work. ➢ Rape / sexual and Gender-Based Violence – Conduct awareness camps among workers and community. Have a code of conduct. Set up Internal Complaints Committees to redress gender related grievances.
Land, Compensation and Resettlement	➢ Non-payment of compensation money – Do not take possession of land before paying full compensation ➢ Underpayment of compensation money – All compensation valuation has to be done as per the LA Act 2013 and verified before payments ➢ Disputes of land ownership – Refer to Revenue Department for measurement and survey to decide on the ownership ➢ Injurious affections such as cracks in buildings, damages to properties – Do take care not to cause damage to houses. Repair all damages and bring them back to original status. ➢ Boundary queries between PAPs – Do not get involved in this. Leave these matters to PAPs to decide themselves.
Road Safety	➢ Accidents – Report immediately to PIU/ PMU. ➢ Humps – Do not erect humps without the permission of PIU. The hump has to be as per the design. No private person can built humps ➢ Signage – All signage has to be fixed by PIU/ Contractor. ➢ Cutting of pavement by utility companies – No utility company can cut the pavement without the permission ➢ Overloaded vehicles/ Road littering – Such incidents to be reported to PIU for action.
Occupational Health and Safety	➢ Protective gear – The workers must wear protective gear at all times during the work. The communities must ➢ HIV/AIDS / Covid-19 services – The workers and communities must be educated about these. They should follow the SoP.
Governance	➢ Procurement – To be transparent and all matters related to procurement to be disclosed ➢ Contractor highhandedness – All contractors to be instructed not to deal with the communities directly. Always involve PIU in dialogue with communities ➢ Corruption – Such cases to be sent to the respective agencies for enquiring and investigation.

Recording, Monitoring, Reporting and Evaluation

The GRM system shall keep a grievance register log. Each grievance will be recorded in the register with the following information at the minimum:

- Type of grievance;
- Description of grievance;
- Gender-disaggregate data of complainant/grievance;
- Date of receipt acknowledgement returned to the complainant,
- Description of actions taken (investigation, corrective measures), and
- Date of resolution and closure / provision of feedback to the complainant OR Date of escalation to Tier II then
- Description of actions taken (investigation, corrective measures) by Tier II
- Date of resolution and closure / provision of feedback to the complainant by Tier II

The monitoring of Grievance management will be through a set of indicators ensuring effective and timelyresolution of grievance. The indicators will be measures within the regular E&S Monitoring report. Theindicators are listed below:

- Number of Grievances received;
- Number (%) of Grievances acknowledged within the timeframe;
- Number (%) of Grievances unilaterally decided;
- Number (%) of Grievances closed within the specified timeframe;
- Number (%) of grievance related to a same or repeated event and /or location to identify areas most affected by potentially negative impacts of the project.
- Number (%) of grievance received comparing to the previous reporting period.
- Number (%) of complainant satisfied with the process (timely, fair)
- Number (%) of complainant satisfied with the outcome.

If there are more than 30 complaints / grievances recorded, the Project Manager may decide to investigate anypatterns or repetition of issues that need addressing. The Project Manager may decide to get an independentconsultant to review and provide advice.

CHAPTER 12: Indigenous Peoples Planning Framework

The Government of India has special concern and commitment for the well-being of the Scheduled Tribes (ST), who suffer as a Group due to their social and economic backwardness and relative isolation. The Constitution of India made certain special safeguards to protect these communities from all the possible exploitation and thus ensure social justice. The Constitution also enjoins upon the State to make special provisions for the advancement of any socially and educationally backward classes and empowers the State to make provisions for reservation in appointments or posts in favour of any backward class of citizens. According to the Census of India 2011, 8.61 percent of the Indian population is classified as ST. In comparison to the national figure, Assam has 12.45 percent of its populations classified as ST. The list of Scheduled Tribes peoples in Assam as per Census 2011 is presented in **Table** .

Table 49: District wise Scheduled Tribe Population in Assam

Sr. No	Districts	Total Population	Scheduled Tribes (STs)	% of total population
1	Barpeta	16,93,622	27,344	**1.61%**
2	Dhemaji	6,86,133	3,25,560	**47.45%**
3	Dibrugarh	13,26,335	1,02,871	**7.76%**
4	Golaghat	10,66,888	1,11,765	**10.48%**
5	Jorhat	10,92,256	1,39,971	**12.81%**
6	Lakhimpur	10,42,137	2,49,426	**23.93%**
7	Sivasagar	11,51,050	49,039	**4.26%**
8	Baksa	9,50,075	3,31,007	**34.84%**
9	Bongaigaon	7,38,804	18,835	**2.55%**
10	Cachar	17,36,617	17,569	**1.01%**
11	Chirang	4,82,162	1,78,688	**37.06%**
12	Darrang	9,28,500	8,419	**0.91%**
13	Dhubri	19,49,258	6,332	**0.32%**
14	Dima Hasao	2,14,102	1,51,843	**70.92%**
15	Goalpara	10,08,183	2,31,570	**22.97%**
16	Hailakandi	6,59,296	691	**0.10%**
17	Kamrup	15,17,542	1,82,038	**12.00%**
18	Kamrup Metro	12,53,938	75,121	**5.99%**
19	Karbi Anglong	9,56,313	5,38,738	**56.33%**
20	Karimganj	12,28,686	1,940	**0.16%**
21	Kokrajhar	8,87,142	2,78,665	**31.41%**
22	Morigaon	9,57,423	1,36,777	**14.29%**
23	Nagaon	28,23,768	1,15,153	**4.08%**
24	Nalbari	7,71,639	23,364	**3.03%**
25	Sonitpur	19,24,110	2,32,207	**12.07%**
26	Tinsukia	13,27,929	82,066	**6.18%**
27	Udalguri	8,31,668	2,67,372	**32.15%**
	Assam Total	**3,12,05,56**	**38,84,371**	**12.45%**

In order to address the chance of potential impact to the indigenous people, as per the definition of AIIB, near to or alongside the proposed Sub-station and Transmission Lines, an Indigenous Peoples Planning Framework (IPPF) is prepared and this is guided by National and State Policy and developed and the Environmental and Social Standard 3 (ESS3): Indigenous People of Environmental and Social Framework (ESF) of AIIB.

The identification of any indigenous people, as per the AIIB ESS3, among the affected persons will be performed by qualified social expert. If any indigenous people are impacted, the Indigenous Peoples Planning framework (IPPF) will provide guidance in the preparation of the Tribal Plan (equivalent to the Indigenous Peoples Plan required by AIIB's ESS3), conduct of meaningful consultation and obtaining broad community support. It will also guide in designing and implementing sub-projects to ensure that IPs: (a) receive culturally appropriate social and economic benefits; (b) do not suffer adverse impacts as a result of Projects; and (c) can participate actively in Projects, if the sub-project affects any people in indigenous in nature.

Specifically, if any of the subprojects affect tribal populations, the Indigenous Peoples Planning Framework (IPPF) shall ensure that:

- Avoid adverse impacts on them, or when avoidance is not possible, to minimize or mitigate such adverse impacts by exploring all possible alternatives.
- Provide benefits and compensation equal to that of the main stream population.
- Provide special assistance as per laws and policies because of their vulnerabilities vis-à-vis the mainstream population.
- Conduct adequate and continued meaningful consultation on the Project in a culturally appropriate, accessible and inclusive manner (including gender considerations), and facilitate their informed participation.
- Design the project and the project benefits to the tribal groups in a culturally appropriate manner.
- Outline culturally sensitive grievance procedures.
- Discuss monitoring and evaluation arrangements, budget and time-bound actions for implementing planned measures

Preserve cultural and economic preferences for indigenous following the implementation of the project based on commonly recognized principles and national and international regulations. Ensure constructive participation and consultations with the affected indigenous communities that would consider their customs and needs throughout the cycle of the project.

12.1 Policy Framework- Applicable National Laws, Regulations and AIIB'S ESF/ESS3

Policy and Legal Framework

The Constitution of India, identifies a Scheduled Tribe (ST) by taking into consideration various factors of: (i) primitive traits, (ii) distinctive culture, (iii) geographical isolation, and (iv) social and economic backwardness. The scheduled tribe is judged by one or a combination of these factors by the respective state. Essentially, indigenous people have a social and cultural identity distinct from the 'mainstream' society that makes them vulnerable to being overlooked or marginalized in the development processes.

There are several policies which provide a legal framework for ensuring dedicate attention to the tribals. Article 366 (25) of the Indian constitution refers to Scheduled Tribes (STs) as those communities who are scheduled in accordance with Article 342 of the Constitution. According to Article 342 of the Constitution, STs are the tribes or tribal communities or part of or groups within these tribes and tribal communities which have been declared as such by the President through a public notification. Identification of tribes is a State subject. Thus, classification of a tribe would depend on the status of that tribe in the respective State. Further the Fifth and Sixth Schedule of the constitution provides special provision for Tribal People in selected regions of the country.

The Fifth Schedule to the Constitution lays down certain prescriptions about the Scheduled Areas as well as the Scheduled Tribes in states other than Assam, Meghalaya, Tripura and Mizoram by ensuring submission of Annual Reports by the Governors to the President of India regarding the Administration of the Scheduled Areas and setting up of Tribal Advisory Councils to advise on matters pertaining to the welfare and advancement of the STs (Article 244(1)). Likewise, the Sixth Schedule to the Constitution also refers to the administration of Tribal Areas in the states of Assam, Meghalaya, Tripura and Mizoram by designating certain tribal areas as Autonomous Districts and Autonomous Regions and also by constituting District Councils and Regional Councils (Article 244(2)). To ensure effective participation of the tribals in the process of planning and decision-making, the 73rd and 74th Amendments of the Constitution are being extended to the Scheduled Areas through the Panchayats (Extension to the Scheduled Areas) PESA Act, 1996.

In Assam, certain areas have been declared as scheduled area as Specified by the Scheduled Areas under the Sixth Schedule of Indian Constitutions. Six schedule areas in Assam are Bodoland Territorial Council, Karbi Anglong Autonomous Council, Dima Hasao Autonomous District Council20.
The relevant laws, act, rules, policy and guidelines on Tribal peoples are, a) National Tribal Policy (2006); b) Forest Rights Act (FRA), 2006; and c) Environmental and Social Standard 3 (ESS 3) of the Environmental and Social Framework (ESF) of the Asian Infrastructure Investment Bank (AIIB).

a. National Tribal Policy (2006)

The Policy has the following objectives:

- **Regulatory Protection**
  - Providing an environment conducive to the preservation of traditional and customary systems and regime of rights and concessions enjoyed by different ST communities, and reconciliation of modes of socio-economic development with these.
  - Preventing alienation of land owned by STs and restoring possession of wrongfully alienated lands.
  - Protection and vesting of rights of STs on forestlands and other forest rights including ownership over minor forest produce (MFP), minerals and water bodies through appropriate legislations and conversion of all forest villages into revenue villages.
  - Providing a legislative frame for rehabilitation and resettlement in order to minimize displacement, ensure that affected persons are partners in the growth in the zone of influence, provide for compensation of social and opportunity cost in addition to market value of the land and rights over common property.
  - Protection of political rights to ensure greater and active participation of tribal peoples in political bodies at all levels.

- **Alienation of Tribal Land**
  - Alienation of tribal land is the single most important cause of pauperization of tribal peoples, rendering their vulnerable economic situation more precarious. Poor land record system in tribal areas coupled with the illiteracy, poverty and ignorance of tribal peoples and the greed of others have resulted in the continuous transfer of resources from tribals to non-tribals for several decades. Competent legal aid will be made available timely to tribals at all stages of litigation.

[20] Govt. of Assam has recently created 6 more Autonomous Councils viz. Rabha Hasong Autonomous Council (RHAC), MishingAutonomous Council (MAC), Tiwa Autonomous Council (TAG), Deori Autonomous Council (DAC), Thengal Kachari Autonomous Council (TKAC) and Sonowal Kachari Autonomous Council (SKAC).

b. Scheduled Caste and Scheduled Tribes Orders (Amendment) Act, 2002

The Act provides for the inclusion in the lists of Scheduled Tribes (ST), of certain tribes or tribal communities or parts of or groups within tribes or tribal communities, equivalent names or synonyms of such tribes or communities, removal of area restrictions and bifurcation and clubbing of entries; imposition of area restriction in respect of certain castes in the lists of Scheduled Castes (SC) and the exclusion of certain castes and tribes from the lists of SCs and STs.

c. Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

To recognize and vest the forest rights and occupation in forest land in forest dwelling STs who have been residing in such forests for generations but whose rights could not be recorded; to provide for a framework for recording the forest rights so vested and the nature of evidence required for such recognition and vesting in respect of forest land.

This Act recognizes that a majority of STs continue to live below the poverty line, have poor literacy rates, suffer from malnutrition and diseases and are vulnerable to displacement and the policy aims at addressing each of these problems in a concrete way. It also lists out measures to be taken to preserve and promote tribal cultural heritage.

The main objective is to facilitate the overall development and welfare of the tribal people by empowering them educationally, socially, economically and politically without any impact on them culture, habitation, traditions and in terms of their age-old rights and privileges.

d. ESS3- Indigenous People of AIIB ESF, February 2019

The objectives of the AIIB's ESF Environmental and Social Standards 3 (ESS3) on Indigenous Peoples21 is to design and implement projects in a way that fosters full respect for indigenous peoples' identity, dignity, human rights, economies and cultures, as defined by the Indigenous Peoples themselves, so that they: (i) receive culturally appropriate social and economic benefits; (ii) do not suffer adverse impacts as a result of projects; and (iii) can participate actively in projects that affect them.

ESS3 applies if indigenous peoples are present in, or have a collective attachment to, the proposed area of the project, and are likely to be affected by the project.

Consultations: Carry out a process of meaningful consultation on the Project with affected Indigenous Peoples communities and concerned Indigenous Peoples organizations, in a culturally appropriate, accessible and inclusive manner, and facilitate their informed participation: (i) in designing, implementing and monitoring measures to avoid adverse impacts or, when avoidance is not possible, to minimize, mitigate, offset or compensate for such impacts; and (ii) in tailoring Project benefits to affected Indigenous Peoples communities in a culturally appropriate manner. To enhance affected Indigenous Peoples' active participation, provide for culturally appropriate, and gender inclusive capacity development in the Project.

[21]There being no universally accepted definition of Indigenous Peoples. Indigenous Peoples may be referred to in different countries by such terms as "indigenous ethnic minorities," "aboriginals," "hill tribes," "minority nationalities," "scheduled tribes," "first nations," or "tribal groups." As the applicability of such terminology varies widely from country to country, the Client may agree with the Bank on an alternative terminology for the Indigenous Peoples as appropriate to the circumstances of the Client.

Special Considerations in Consultations: In addition, ensure that this process: (i) involves Indigenous Peoples' representative bodies and organizations (e.g., councils of elders, village councils or chieftains) and, where appropriate, other community members; (ii) provides sufficient time for Indigenous Peoples' decision-making processes; and (iii) allows for Indigenous Peoples' effective involvement in the design of Project activities or mitigation measures that may affect them either positively or adversely.

Free, Prior and Informed Consultation (FPICon): Since Indigenous Peoples may be particularly vulnerable to the loss of, alienation from, or exploitation of their land and access to natural and cultural resources, engage in FPICon and obtain the broad support of the affected Indigenous Peoples if activities under the Project would: (i) have impacts on land and natural resources subject to traditional ownership or under customary occupation or use; (ii) cause relocation of Indigenous Peoples from land and limitations on access to natural resources subject to traditional ownership or under customary occupation or use; or (iii) have significant impacts on Indigenous Peoples' cultural heritage. In these circumstances, engage suitably qualified and experienced independent experts to assist in the identification of the Project's risks to and impacts on Indigenous Peoples.

As per AIIB ESS 3, FPICon is established as follows: (i) the scope of FPICon applies to Project design, implementation arrangements and expected outcomes related to risks to, and impacts on, the affected Indigenous Peoples; (ii) FPICon builds on the process of meaningful consultation and requires good faith negotiation between the Client and these affected Indigenous Peoples; (iii) the Client documents: (1) the mutually accepted process of consultation between the Client and these Indigenous Peoples; and (2) evidence of broad community support of these Indigenous Peoples on the outcome of the negotiations; and (iv) FPICon does not require unanimity and may be achieved even when individualsor groups within or among these affected Indigenous Peoples explicitly disagree with support for the Project. When the Bank is unable to ascertain that such broad community support has been obtained from the affected Indigenous Peoples, exclude from the Project those activities that would affect those Indigenous Peoples. In such cases, ensure that the Project, as redesigned, will not have adverse impacts on such Indigenous Peoples. If the Bank has determined, that the laws of the country in which the Project is located mandate free, prior and informed consent (FPIC), and that the Client is required to apply FPIC, apply FPIC as defined in those laws, in the manner required by the Bank.

Information Disclosure: Disclose the draft Indigenous Peoples plan, including documentation of the consultation process and the results of the social impact assessment in a timely manner, in the Project area, in an accessible place and in a form and language(s) understandable to affected Indigenous Peoples communities and other stakeholders. Disclose the final Indigenous Peoples plan and its updates to the affected Indigenous Peoples communities and other stakeholders in the same manner. Disclose any IPPF in the same manner. Regularly disclose updated environmental and social information relating to indigenous Peoples, along with information on any relevant material changes in the Project.

Action Plan: If the Project involves (i) activities that are contingent on establishing legally recognized rights to lands and territories that Indigenous Peoples have traditionally owned or customarily used or occupied (such as land titling activities) or (ii) the acquisition of such lands, prepare and include in the Indigenous Peoples plan an action plan for the legal recognition of such ownership, occupation, or use.

Monitoring: Monitor implementation of the Indigenous Peoples plan using suitably qualified and experienced experts; adopt a participatory monitoring approach, wherever possible; and assess whether the plan's objective and desired outcome have been achieved, considering the baseline

conditions and the results of monitoring of the plan. Use of suitably qualified and experienced third parties to support monitoring programs.

12.2 Process and Preparation of IPP

AIIB's ESS3 has used the term Indigenous Peoples in a generic sense to refer to a distinct, vulnerable, social and cultural group. A group shall be assessed and identified as IP if they possess the following characteristics in varying degrees:

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- customary, cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and a distinct language, often different from the official language of the country or region.

If during this screening it is determined that Tribal Groups considered as IPs are present in or have collective attachment to the project area, and likely to be affected by the project, then an Indigenous Peoples Plan or Tribal Plan has to be prepared. Similarly, Article 342 of the Constitution indicates five characteristics to define Scheduled Tribes (ST): (i) tribes' primitive traits; (ii) distinctive culture; (iii) shyness with the public at large; (iv) geographical isolation; and (v) social and economic backwardness. The Scheduled Tribes or indigenous people have a social and cultural identity distinct from the 'mainstream' society and are often marginalized, overlooked and vulnerable during the development processes. The significance of a project's impact on indigenous people, if any, will be determined by the following assessment:

Magnitude of impact in terms of

- customary rights of use and access to land and natural resources;
- socioeconomic status;
- cultural and communal integrity;
- health, education, livelihood, and social security status;
- recognition of social security status; and
- recognition of indigenous knowledge.

Level of vulnerability of the affected tribal people

The affected Indigenous People will be identified in each of the sub-project road corridors. The significance of a project's impact on indigenous people, if any, will be determined by the following assessment:

i) Magnitude of impact in terms of:
   (a) customary rights of use and access to land and natural resources;
   (b) socioeconomic status;
   (c) cultural and communal integrity;
   (d) health, education, livelihood, and social security status;
   (e) recognition of indigenous knowledge; and

ii) Level of vulnerability of the affected tribal people.

The Indigenous Peoples Plan (IPP) will address the issues of affected indigenous persons and affected indigenous communities, if any. The Indigenous Peoples Plan (IPP) will also be prepared, where indigenous is host community and project will affect them directly or indirectly to them in terms of distinctiveness or in their indigeneity.

A. Key Issues and Likely Adverse Impacts on the Tribal Population

Assam has several areas inhabited by tribal communities, with a Scheduled Tribe (ST) population of 12.45% to the total population. The plain areas of Assam have only 11% of ST populations in 14 tribes, whereas, the three autonomous hill districts (Karbi Anglong, West Karbi Anglong and Dima Hasao), which are not included in the project.

The possible impact of the tribal population (if any):

- Loss of Land (agricultural/ homestead/ commercial/ fallow/ Eksonia land etc.)
- Loss of crops and trees
- Loss of Structures (Residential/ Commercial/ Residential cum Commercial) of Titleholders and Non-titleholders
- Loss of Community/ Religious land and Structures and other Community properties
- Loss of livelihoods, including the loss of Tenancy and loss of Employment opportunities
- Loss of permanent or temporary access or restriction of access to resources
- Disproportionate impacts on the tribal women and more vulnerable groups of the tribal population
- Escalation of social tension and heightened risk of GBV and STDs as result of labour influx

The identification of impact on indigenous peoples in the respective sub-project roads through design finalisation and social survey, respective Resettlement Plan and Indigenous Peoples Plan will present social issues and identified adverse impacts of the sub-project roads.

B. Approach and Steps for IPP preparation

Approach

The qualified social scientists will screen and identify the Indigenous People, based on the criteria outlined in ESS3. The screening shall gather information on the following:

(a) Name of Scheduled Tribes or groups in the area,
(b) Number of IP/ST Groups in the area, and
(c) potential ST households affected by subproject.

Once an IP group has been identified and there is potential impacts, engage an IP Specialist to help in the conduct of assessment and preparation of an IPP or Tribal Plan. Assessment of impacts to IPs will consider the:

i) Magnitude of impact in terms of:
(a) customary rights of use and access to land and natural resources;
(b) socioeconomic status;
(c) cultural and communal integrity;
(d) health, education, livelihood, and social security status;
(e) recognition of social security status;
(f) recognition of indigenous knowledge; and

ii) Level of vulnerability of the affected tribal people.

If the project has any impact on indigenous people, then, the ESS 3 of ESF of AIIB will be triggered and Indigenous Peoples Plan will be prepared. A social impact assessment (SIA) will be carried out to assess the IP issues, impacts on IPs (negative and positive) and identify mitigating measures and development opportunities that exist in the area. The SIA shall be undertaken in a culturally appropriate and gender-sensitive social way. The level of detail and comprehensiveness of the IPP will be proportionate to the significance of potential impacts on Indigenous Peoples.

While the census survey will be used to identify the DPs belonging to the ST communities and the qualified social scientists with his/ her expertise will verify DPs for their indigenous category to assess the potential impacts. Meaningful consultations will be held with the indigenous communities, if any, to secure their consent for the proposed road development. Strategies for addressing impacts on these indigenous displaced families were formulated based on secondary data, field observation and consultation.

The SIA would include gathering of the following relevant information about indigenous communities to assess their vulnerability, develop measures to mitigate impacts and plan to engage with indigenous populations.

- Background demographic, socio-economic, cultural conditions of the affected indigenous communities within the project area of influence, if any
- Assessment of lands and territories traditionally used and occupied by indigenous communities
- Assessment of natural resources on which indigenous communities depend
- Assessment of access and possibilities to use socio-economic services
- Assessment of a short-term and long-term outlook, direct and indirect, positive and adverse impacts of the project on social, economic and cultural life of indigenous communities
- Assessment of resources required to minimize impacts on indigenous communities during the implementation of the project.

C. Tribal Land Acquisition/ Transfer Process

Types of Tribal Land: The land of the indigenous tribals in Assam are non-cadastral land, where ownership of land is of the community instead of private ownership. Assam has defined land transfer process for the Non-Cadastral Land. The non-cadastral land is majorly situated in the three hill districts of Assam, viz., a) Karbi Anglong, b) West Karbi Anglong and c) Dima Hasao, which are not in the scope of the proposed project.

There are lands under private ownership of Scheduled Tribe (ST) peoples in Assam. The requirement of private lands for the project, under private ownership of either non-tribal people or tribal people, will follow Direct Purchase policy of Assam.

There are also some Eksonia[22]Land, where the land holding is of the Scheduled Tribe persons. The requirement of Eksonia land in the project will be acquired also through Direct Purchase policy, subject to Govt. Guidelines of conversion of Eksonia land to Myadi Patta (ownership land).

If the Direct Purchase policy fails for ownership land, such land will be acquired through Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Rules 2015 prepared under RFCTLARR Act 2013.

[22]Eksonia Land Holder, whose land holding can be converted to Periodic patta Land (MyadiPatta) as per permissible limits ofGovt. of Assam, will be considered as Land owners, subject to conversion of the Eksonia land to Periodic patta land.

Land Acquisition Process of Non-Cadastral Land in Assam: The process of transfer of non-cadastral land for an acquiring agency has to be approved by the respective Autonomous District Councils of concerned districts, the Assam Gazette Notification is provided in **Appendix 20 (a)**. However, any requirement of non-cadastral land for the project have not been identified or anticipated so far.

Free, Prior and Informed Consultation of Indigenous Communities:

In some cases, when the subprojects have an adverse impact on indigenous communities, if any, the project should implement the Free, Prior and Informed Consent (FPICON) of the affected indigenous communities in relation to the structure, implementation and expected outcomes of the project. Under international requirement, FPICON is required if activities under the project would:

- Affect the indigenous communities' customary rights of use and access to land and natural resources
- Affect their health, education, livelihood systems and social security status
- Disrupt their cultural and communal integrity and heritage
- Change or undermine recognition of indigenous knowledge
- FPICON
- Free: consent is given voluntarily and without coercion, intimidation or manipulation. A process that is self-directed by the community from whom consent is being sought, unencumbered by coercion, expectations or timelines that are externally imposed.
- Prior: consent is sought sufficiently in advance of any authorization or commencement of activities, at the early stages of a development or investment plan, and not only when the need arises to obtain approval from the community.
- Informed refers mainly to the nature of the engagement and type of information that should be provided prior to seeking consent and also as part of the ongoing consent process.
- Consent is a collective decision made by the rights-holders and reached through the customary decision-making processes of the communities. Consent must be sought and granted or withheld according to the unique formal or informal political-administrative dynamic of each community.
- Local communities must be able to participate through their own freely chosen representatives, while ensuring the participation of youth, women, the elderly and persons with disabilities as much as possible.

FPICON comprises both a process and an outcome. The process builds upon the requirements for informed consultation and participation and additionally requires good faith negotiation between the client and affected communities of indigenous peoples. Good faith negotiation involves on the part of all parties:

- Willingness to engage in a process and availability to meet at reasonable times and frequency
- Provision of information necessary for informed negotiation
- Discussion of issues important to the indigenous peoples
- Use of mutually acceptable procedures for negotiation
- Willingness to change initial position and modify offers where possible and
- Provision of sufficient time for decision making

The outcome, where the good faith negotiation process is successful, is an agreement and evidence thereof.

D. Engagement with Indigenous Communities when locating project sites on lands traditionally owned by Indigenous Peoples

If the project proposes to locate the subprojects on lands traditionally owned by, or under the customary use of, Indigenous Peoples and adverse impacts can be expected the project will take the following steps:

- Document efforts to avoid and otherwise minimize the area of such land proposed for the project
- Document efforts to avoid and otherwise minimize impacts on natural resources and natural areas of importance to Indigenous People
- Assess and document affected communities of Indigenous Peoples' resource use without prejudicing any Indigenous Peoples' land claim. The assessment of land and natural resource use should be gender inclusive and specifically consider women's role in the management and use of these resources
- Ensure the affected communities of Indigenous Peoples are informed of their land rights under national law, including any national law recognizing customary use rights and
- Offer affected communities of Indigenous Peoples' compensation and due process in the case of development of their land and natural resources, together with culturally appropriate sustainable development opportunities, including:
  - providing land-based compensation or compensation in kind in lieu of cash compensation where feasible
  - Provide indigenous people a process through which they can register their grievances.
  - ensuring continued access to natural resources identifying the equivalent replacement resources, or, as a last option, providing compensation and identifying alternative livelihoods if project development results in the loss of access to and the loss of natural resources independent of project land acquisition
  - providing affected communities of Indigenous Peoples with access, usage and transit on land it is developing subject to overriding health, safety and security considerations. These circumstances will have a priority importance.

E. Indigenous Peoples Plan

If the sub-project is found to have impact on indigenous community, the Indigenous Peoples Plan (IPP), in line with this IPPF will be prepared. The breadth and depth of the IPP should be proportional to the nature and scale of the proposed project's potential impact. The subproject IPPs should be prepared satisfactory to AIIB and integrates the (i) aspirations, needs, and preferred options of the affected indigenous peoples; (ii) social structure and organization, cultural beliefs, ancestral territory, and resource use of the indigenous peoples; (iii) positive and negative impacts on the indigenous peoples; (iv) measures to avoid, mitigate, or compensate for the adverse project effects; (v) measures to ensure project benefits will accrue to indigenous peoples; (vi) measures to strengthen social, legal, and technical capabilities of government institutions to address indigenous people's issues; (vii) the possibility of involving local organizations and non-governmental organizations with expertise in indigenous people's issues; (viii) budget allocation; and (ix) monitoring.

F. Consultation and Participation

The Focus Group Discussions exclusively with each of the Indigenous Peoples Community through:

- Arrangement of Venue(s), for each of the Indigenous Community, in their respective suitable places, which are commonly known to the Indigenous Community(ies) and also in the very convenient place to reach by the vulnerable and disabled people.

- Special care has been taken to arrange the Venue in a way to ascertain the attendance of women face no hesitation.
- The Consultations will be arranged in daytime, excepting the usual peak time of their daily economic and personal activities, to facilitate that all interested persons including the women, children and disabled persons to attend.
- The Consultations will also be arranged in normal local holidays to ascertain that the vulnerable or marginalized peoples get assistance from other persons to reach and attend.
- Pre-information, through Key persons/ Community Leaders/ Gaon Buras/ informing community gatherings etc., of Consultation will facilitate the social inclusion of the vulnerable groups including women, disabled persons to have information at ease.
- Care should be taken for discussions to be held in local language of the community to confirm their active participation in discussions
- The discussions will be properly documented and presented.

G. Disclosure of IPPF & IPP

The subproject IPPs will be prepared in consultation with the affected IPs. The subproject IPP will be translated into local language of the Community and/or other form of presentation, which will familiar to the IP group. This will be made available to them before the implementation of the Plan by the PMU and related information will be disseminated to affected indigenous people, if any, at various stages of the project through project selection, preparation and project implementation period. The Executing Agency shall ensure that adequate resources, in terms of budget and implementing staff, is in place to ensure the effective implementation of the Plan. The copies of the Indigenous Peoples Planning Framework and Indigenous Peoples Plan, if required will also be made available at: (i) offices of the PMU and PIU; (ii) relevant villages, (iii) in the dedicated website of Asom Mala, and (iv) AIIB website. A report of disclosure, giving details of date and location will be shared with the AIIB. The following documents shall also be submitted to AIIB and disclosed on the EA's and AIIB's website: (i) Indigenous Peoples Planning Framework, (ii) Subproject Indigenous Peoples Plan (draft and final), (iii) Monitoring Reports, and (iv) Completion Report.

12.3 Budget & Financing

Detailed budget estimates for each sub-project Indigenous Peoples Plan, if required, will be prepared and will be included in the overall tranche of project budget. The budget shall include: (i) All costs of Direct Purchase; (ii) Cost of land acquisition and R&R Assistances, if any; (iii) Resettlement & Rehabilitation Assistances for Non-titleholders, if any; (iv) livelihood and income restoration of Affected Persons; (v) cost of RP Implementation Agency; (vi) cost for Grievance Redress Mechanism; (vii) Cost of consultation/ disclosure and (viii) monitoring and evaluation costs.

Adequate resources shall be provided by the executing agency to formulate an IPP for each subproject that will have impacts on IPs. A detailed budget will be prepared in the IPP considering all activities associated with the formulation and implementation of the IPP. Such budgets will be an integral part of the program cost, and will be made available during program implementation. The budget should be made available in advance to it's PIU for implementation of IPP.

The disbursement of compensation for land acquisition of assets will be carried out by the Deputy Commissioner's office, and calculated as per the basis given in the Entitlement Matrix. In the case of assistance, the PMU may directly pay into the individual accounts of affected persons. The RP Implementation Agency will be involved in facilitating the disbursement process and rehabilitation program, and will facilitate opening bank accounts for the affected persons who do not have bank accounts.

Appendix 1: Sub-project Components

2. New 220/132 kV (2X160 MVA) GIS Substation at Rowta

Sl.No.	Equipment	Nos. / Length	Details
1. Inter Connecting Transformers (ICTs)			
a	220/132kV	2 nos.	2 x 160 MVA ICTs
2. 220 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	4 nos.	
c	Bus Coupler	1 no.	
3. 220 kV Connectivity			
a	Erection of 220kV D/c line with Single AAAC Zebra conductor	69.238 km	220kV Rowta (New) - New Rangia (Tamulpur) D/C Line
4. 132kV Bays			
a	Transformer bays	2 nos.	
b	Feeder bays	4 nos.	
c	Bus Coupler	1 no.	

3. New 132/33 kV (2 X 50 MVA) AIS Substation at Agamoni

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132 kV LILO of Gossaigaon - Gauripur S/C (Existing) Line at Agamoni (New) with ACCC Casablanca conductor	10 km approx..	132 kV LILO of Gossaigaon - Gauripur S/C (Existing) Line at Agamoni (New)

4. New 220/33 kV (2X100 MVA) GIS Substation at Boragaon

Sl.No.	Equipment	Nos. / Length	Details
1. 220 kV Inter Connecting Transformers (ICTs)			
a	220/33kV	2 nos.	2 x 100 MVA ICTs
2. 220 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 220 kV Connectivity			
a	Erection of 220kV Boragaon (Jalukbari)(New) - Kukurmara (Existing) D/C Line with Single AAAC Zebra conductor	21 km approx.	220kV Boragaon (Jalukbari)(New) - Kukurmara (Existing) D/C Line

5. New 220/33 kV (2X100 MVA) GIS Substation at Panjabari

Sl.No.	Equipment	Nos. / Length	Details
1. 220 kV Inter Connecting Transformers (ICTs)			
a	220/33kV	2 nos.	2 x 100 MVA ICTs
2. 220 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	

Sl.No.	Equipment	Nos. / Length	Details
c	Bus Coupler	1 no.	
3. 220 kV Connectivity			
a	Erection of LILO of 220kV Sonapur (Existing) – Sarusajai (Existing) line at Panjabari with Single AAAC Zebra conductor	3 km approx.	LILO of 220kV Sonapur-Sarusajai (Existing) -S/C Line at Panjabari

6. New 132/33 kV (2X50 MVA) GIS Substation at Zoo Road

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50 MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of LILO of 132kV Kahilipara (existing) – Narengi (existing) S/c via combination of overhead conductor (HTLS ACCC Casablanca conductor) and underground 132kV XLPE Cable	8 km approx..	LILO of 132kV Kahilipara (existing) – Narengi (existing) S/C line at Zoo Road.

7. New 132/33 kV (2X 0 MVA) AIS Substation at Serfanguri

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50 MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132kV Serfanguri (New) – Gossaigaon (existing) D/c line with Single AAAC Panther conductor	19.358 Km	132kV Serfanguri (New) - Gossaigaon (Existing) D/C Line

8. New 132/33 kV (2X50 MVA) AIS Substation at Dhing

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50 MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132kV Dhing (New) – Khaloigaon (Existing) D/C line with Single AAAC Panther conductor.	28.962 km	132kV Dhing (New) - Khaloigaon (Existing) D/C Line

9. New 132/33 kV (2X50 MVA) AIS Substation at Udarbond (Silchar-2)

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50 MVA ICTs

Sl.No.	Equipment	Nos. / Length	Details
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	4 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of LILO of 132KV Pailapool (Existing) -Srikona (Existing) Line at Udarbond with ACCC Casablanca conductor	0.952 km	LILO of 132KV Pailapool (Existing) -Srikona (Existing) Line at Udarbond

10. New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132kV Titabor (New) – Mariani (Existing) D/C Line with Single AAAC Panther conductor	8.763 km	132kV Titabor (New) - Mariani (Existing) D/C Line

11. Establishment of new 132/33 kV (2 X 50 MVA) AIS Substation at Chabua

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler1	1 no.	
3. 132 kV Connectivity			
a	Erection of LILO of Tinsukia (Existing) - Dibrugarh (Existing) S/C Line {LILO part of Dibrugarh – Chabua with Single AAAC Panther conductor} {LILO part of Tinsukia – Chabua with HTLS ACCC Casablanca conductor}	1.402 km	LILO of Tinsukia (Existing) -Dibrugarh (Existing) S/C Line

12. New 220/132/33 kV (2 X50 MVA) AIS Substation at Morigaon (Dharamtul)

Sl.No.	Equipment	Nos. / Length	Details
1. Inter Connecting Transformers (ICTs)			
a	220/132kV	2 nos.	2 x 160 MVA ICTs
b	132/33kV	2 nos.	2 x 50 MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder bays	4 nos.	
c	Bus Coupler	1 no.	
3. 132kV Connectivity			
b	Erection of 132kV Morigaon (New) – Baghjap (Existing) D/c line with Single AAAC Panther conductor	15.68 km approx.	132kV Morigaon (New) – Baghjap (Existing) D/c line

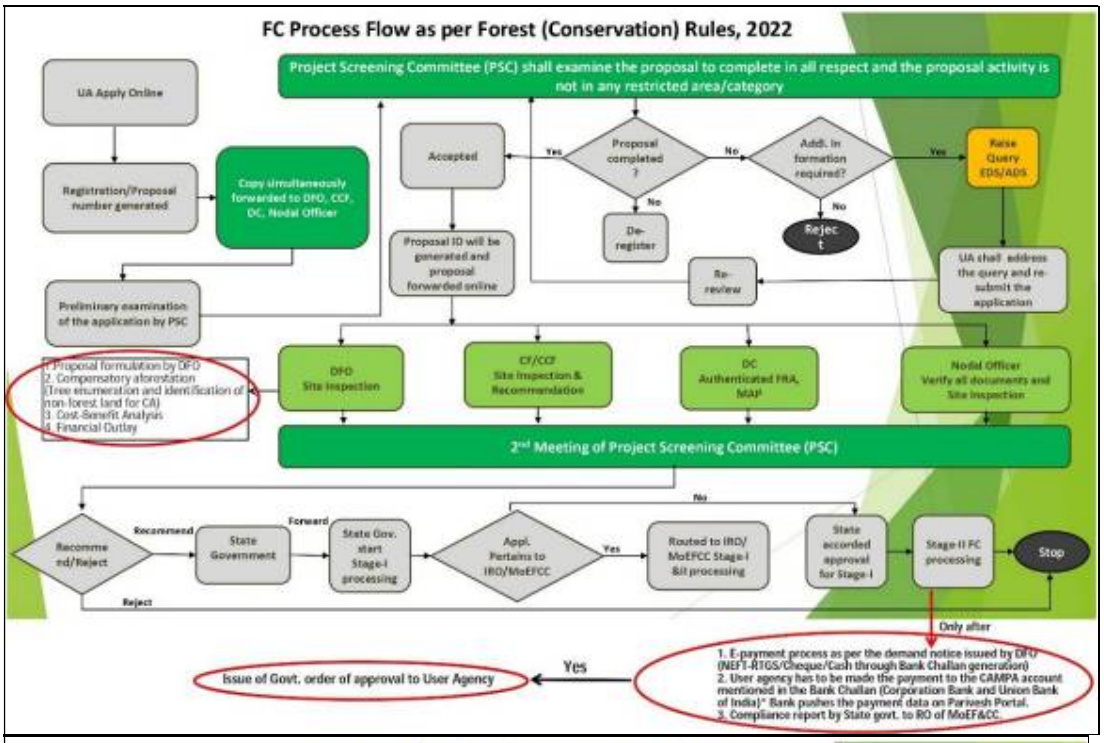
13. New 132/33 kV (2 X 50 MVA) AIS Substation at Amayapur

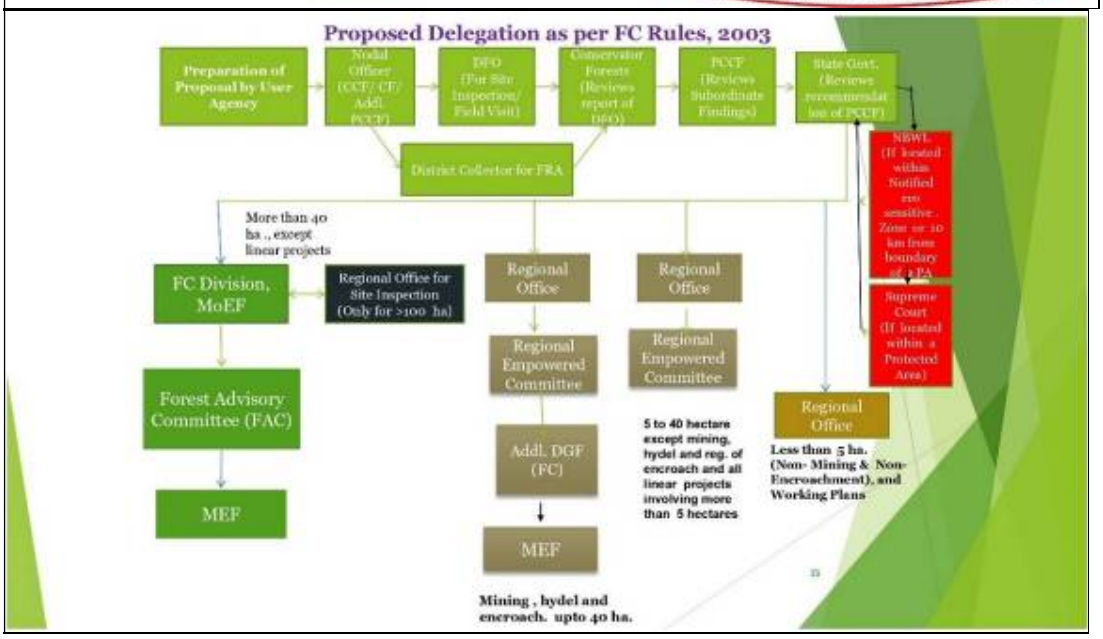
Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50 MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	4 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132kV Amayapur (New) - Hajo (Existing) D/C Line with Single AAAC Panther conductor	25 km approx.	132kV Amayapur (New) - Hajo (Existing) D/C Line

14. New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara

Sl.No.	Equipment	Nos. / Length	Details
1. 132 kV Inter Connecting Transformers (ICTs)			
a	132/33kV	2 nos.	2 x 50MVA ICTs
2. 132 kV Bays			
a	Transformer Bays	2 nos.	
b	Feeder Bays	2 nos.	
c	Bus Coupler	1 no.	
3. 132 kV Connectivity			
a	Erection of 132kV Dhupdhara (New) - Boko (Existing) D/C Line with Single AAAC Panther conductor	25 km approx.	132kV Dhupdhara (New) - Boko (Existing) D/C Line

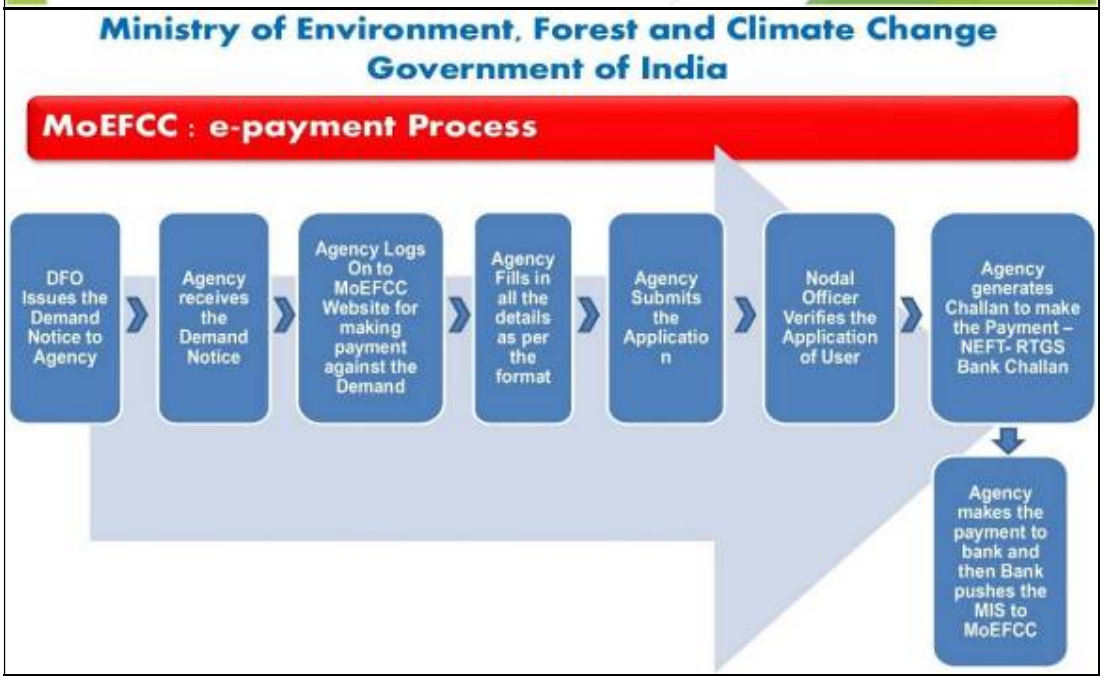
Appendix 2: Forest Diversion process flow





Time- Lines for Processing of Stage-I FC Proposals at State Level

Level	5 ha.	5 to 40 ha	40 to 100 ha	More than 100 ha
Nodal Officer	10	10	10	10
DCF	30	30	45	60
District Collector for FRA				
CF	10	10	30	30
Nodal Officer/ PCCF	10	20	25	30
State Govt.	30	30	30	30
Transit Period	20	20	20	20
Total	**110**	**120**	**150**	**180**



Appendix 3: Ground Water Quality and Surface Water Quality Standards

Indian Standard IS: 10500:2012 (Ground Water)

Table I Organoleptic and Physical Characters

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Colour, Hazen units, *Max*	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources
ii)	Odour	Agreeable	Agreeable	Part 5	a) Test cold and when heated b) Test at several dilutions
iii)	*p*H value	6.5-8.5	No relaxation	Part 11	—
iv)	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
v)	Turbidity, NTU, *Max*	1	5	Part 10	—
vi)	Total dissolved solids, mg/l, *Max*	500	2 000	Part 16	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

Indian Standard IS: 10500:2012 (Ground Water)

Table II:General Parameters Concerning Substances Undesirable in Excess

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aluminium (as Al), mg/l, *Max*	0.03	0.2	IS 3025 (Part 55)	—
ii)	Ammonia (as total ammonia-N), mg/l, *Max*	0.5	No relaxation	IS 3025 (Part 34)	—
iii)	Anionic detergents (as MBAS) mg/l, *Max*	0.2	1.0	Annex K of IS 13428	—
iv)	Barium (as Ba), mg/l, *Max*	0.7	No relaxation	Annex F of IS 13428* or IS 15302	—
v)	Boron (as B), mg/l, *Max*	0.5	1.0	IS 3025 (Part 57)	—
vi)	Calcium (as Ca), mg/l, *Max*	75	200	IS 3025 (Part 40)	—
vii)	Chloramines (as Cl_2), mg/l, *Max*	4.0	No relaxation	IS 3025 (Part 26)* or APHA 4500-Cl G	—
viii)	Chloride (as Cl), mg/l, *Max*	250	1 000	IS 3025 (Part 32)	—
ix)	Copper (as Cu), mg/l, *Max*	0.05	1.5	IS 3025 (Part 42)	—
x)	Fluoride (as F) mg/l, *Max*	1.0	1.5	IS 3025 (Part 60)	—
xi)	Free residual chlorine, mg/l, *Min*	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l
xii)	Iron (as Fe), mg/l, *Max*	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xiii)	Magnesium (as Mg), mg/l, *Max*	30	100	IS 3025 (Part 46)	—
xiv)	Manganese (as Mn), mg/l, *Max*	0.1	0.3	IS 3025 (Part 59)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xv)	Mineral oil, mg/l, *Max*	0.5	No relaxation	Clause **6** of IS 3025 (Part 39) Infrared partition method	—
xvi)	Nitrate (as NO_3), mg/l, *Max*	45	No relaxation	IS 3025 (Part 34)	—
xvii)	Phenolic compounds (as C_6H_5OH), mg/l, *Max*	0.001	0.002	IS 3025 (Part 43)	—
xviii)	Selenium (as Se), mg/l, *Max*	0.01	No relaxation	IS 3025 (Part 56) or IS 15303*	—
xix)	Silver (as Ag), mg/l, *Max*	0.1	No relaxation	Annex J of IS 13428	—
xx)	Sulphate (as SO_4) mg/l, *Max*	200	400	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium does not exceed 30
xxi)	Sulphide (as H_2S), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 29)	—
xxii)	Total alkalinity as calcium carbonate, mg/l, *Max*	200	600	IS 3025 (Part 23)	—
xxiii)	Total hardness (as $CaCO_3$), mg/l, *Max*	200	600	IS 3025 (Part 21)	—
xxiv)	Zinc (as Zn), mg/l, *Max*	5	15	IS 3025 (Part 49)	—

NOTES

1 In case of dispute, the method indicated by '*' shall be the referee method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

Indian Standard IS: 10500:2012 (Ground Water)

Table III:Parameters Concerning Toxic Substances

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Cadmium (as Cd), mg/l, *Max*	0.003	No relaxation	IS 3025 (Part 41)	—
ii)	Cyanide (as CN), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 27)	—
iii)	Lead (as Pb), mg/l, *Max*	0.01	No relaxation	IS 3025 (Part 47)	—
iv)	Mercury (as Hg), mg/l, *Max*	0.001	No relaxation	IS 3025 (Part 48)/ Mercury analyser	—
v)	Molybdenum (as Mo), mg/l, *Max*	0.07	No relaxation	IS 3025 (Part 2)	—
vi)	Nickel (as Ni), mg/l, *Max*	0.02	No relaxation	IS 3025 (Part 54)	—
vii)	Pesticides, µg/l, *Max*	See Table 5	No relaxation	See Table 5	—
viii)	Polychlorinated biphenyls, mg/l, *Max*	0.000 5	No relaxation	ASTM 5175*	— or APHA 6630
ix)	Polynuclear aromatic hydro-carbons (as PAH), mg/l, *Max*	0.000 1	No relaxation	APHA 6440	—
x)	Total arsenic (as As), mg/l, *Max*	0.01	0.05	IS 3025 (Part 37)	—
xi)	Total chromium (as Cr), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 52)	—
xii)	Trihalomethanes:				
	a) Bromoform, mg/l, *Max*	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
	b) Dibromochloromethane, mg/l, *Max*	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	—
	c) Bromodichloromethane, mg/l, *Max*	0.06	No relaxation	ASTM D 3973-85* or APHA 6232	—
	d) Chloroform, mg/l, *Max*	0.2	No relaxation	ASTM D 3973-85* or APHA 6232	—

NOTES

1 In case of dispute, the method indicated by '*' shall be the referee method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

Table IV: Parameters Concerning Radioactive Substances

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 14194	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Radioactive materials:				
	a) Alpha emitters Bq/l, *Max*	0.1	No relaxation	Part 2	—
	b) Beta emitters Bq/l, *Max*	1.0	No relaxation	Part 1	—

NOTE — It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

Indian Standard IS: 10500:2012 (Ground Water)

Table V: Pesticides Residue Limits and Test Method

Sl No.	Pesticide	Limit µg/l	Method of Test, Ref to	
			USEPA	AOAC/ ISO
(1)	(2)	(3)	(4)	(5)
i)	Alachlor	20	525.2, 507	—
ii)	Atrazine	2	525.2, 8141 A	—
iii)	Aldrin/ Dieldrin	0.03	508	—
iv)	Alpha HCH	0.01	508	—
v)	Beta HCH	0.04	508	—
vi)	Butachlor	125	525.2, 8141 A	—
vii)	Chlorpyriphos	30	525.2, 8141 A	—
viii)	Delta HCH	0.04	508	—
ix)	2,4- Dichlorophenoxyacetic acid	30	515.1	—
x)	DDT (*o, p* and *p, p* – Isomers of DDT, DDE and DDD)	1	508	AOAC 990.06
xi)	Endosulfan (alpha, beta, and sulphate)	0.4	508	AOAC 990.06
xii)	Ethion	3	1657 A	—
xiii)	Gamma — HCH (Lindane)	2	508	AOAC 990.06
xiv)	Isoproturon	9	532	—
xv)	Malathion	190	8141 A	—
xvi)	Methyl parathion	0.3	8141 A	ISO 10695
xvii)	Monocrotophos	1	8141 A	—
xviii)	Phorate	2	8141 A	—

NOTE — Test methods are for guidance and reference for testing laboratory. In case of two methods, USEPA method shall be the reference method.

Table VI: Bacteriological Quality of Drinking Water

Sl No.	Organisms	Requirements
(1)	(2)	(3)
i)	*All water intended for drinking:*	
	a) *E. coli* or thermotolerant coliform bacteria[2), 3)]	Shall not be detectable in any 100 ml sample
ii)	*Treated water entering the distribution system:*	
	a) *E. coli* or thermotolerant coliform bacteria[2)]	Shall not be detectable in any 100 ml sample
	b) Total coliform bacteria	Shall not be detectable in any 100 ml sample
iii)	*Treated water in the distribution system:*	
	a) *E. coli* or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml sample
	b) Total coliform bacteria	Shall not be detectable in any 100 ml sample

[1)]Immediate investigative action shall be taken if either *E.coli* or total coliform bacteria are detected. The minimum action in the case of total coliform bacteria is repeat sampling; if these bacteria are detected in the repeat sample, the cause shall be determined by immediate further investigation.

[2)]Although, *E. coli* is the more precise indicator of faecal pollution, the count of thermotolerant coliform bacteria is an acceptable alternative. If necessary, proper confirmatory tests shall be carried out. Total coliform bacteria are not acceptable indicators of the sanitary quality of rural water supplies, particularly in tropical areas where many bacteria of no sanitary significance occur in almost all untreated supplies.

[3)]It is recognized that, in the great majority of rural water supplies in developing countries, faecal contamination is widespread. Under these conditions, the national surveillance agency should set medium-term targets for progressive improvement of water supplies.

Source: Indian Standard (IS: 10500:2012)

Surface Water Quality Standards

The classification of water based on designated use is prescribed below:

Designated-Best-Use	Class of Water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5 Electrical Conductivity at 25C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l

Bureau of Indian Standards (BIS) has also recommended water quality parameters for different uses in the standard **IS 2296:1992**.

Water Quality Standards in India (Source IS 2296:1992)						
Characteristics	**Unit**	**A**	**B**	**C**	**D**	**E**
Biochemical Oxygen demand (BOD)	mg/l	2	3	3	-	-
Total coliform organisms	MPN/100ml	50	500	5000	-	-
pH value		6.5-8.5	6.5-8.5	6.0-9.0	6.5-8.5	6.0-8.5
Colour	Hazen units	10	300	300	-	-
Odour		Un- objectionable			-	-
Taste		Tasteless	-	-	-	-
Total dissolved solids	mg/l	500	-	1500	-	2100
Total hardness (as CaCO3)	mg/l	200	-	-	-	-
Calcium hardness (as CaCO3)	mg/l	200	-	-	-	-
Magnesium hardness (as CaCO3)	mg/l	200	-	-	-	-
Copper (as Cu)	mg/l	1.5	-	1.5	-	-
Iron (as Fe)	mg/l	0.3	-	0.5	-	-
Manganese (as Mn)	mg/l	0.5	-	-	-	-
Chlorides (as Cu)	mg/l	250	-	600	-	600
Sulphates (as SO4)	mg/l	400	-	400	-	1000
Nitrates (as NO3)	mg/l	20	-	50	-	-
Fluorides (as F)	mg/l	1.5	1.5	1.5	-	-
Phenolic compounds (as C2H5OH)	mg/l	0.002	0.005	0.005	-	-
Mercury (as Hg)	mg/l	0.001	-	-	-	-
Cadmium (as Cd)	mg/l	0.01	-	0.01	-	-

Surface Water Quality Standards

Water Quality Standards in India (Source IS 2296:1992)						
Characteristics	Unit	A	B	C	D	E
Selenium (as Se)	mg/l	0.01	-	0.05	-	-
Arsenic (as As)	mg/l	0.05	0.2	0.2	-	-
Cyanide (as Pb)	mg/l	0.05	0.05	0.05	-	-
Lead (as Pb)	mg/l	0.1	-	0.1	-	-
Zinc (as Zn)	mg/l	15	-	15	-	-
Chromium (as Cr6+)	mg/l	0.05	-	0.05	-	-
Anionic detergents (as MBAS)	mg/l	0.2	1	1	-	-
Barium (as Ba)	mg/l	1	-	-	-	-
Free Ammonia (as N)	mg/l	-	-	-	1.200	-
Electrical conductivity	micromhos/c m	-	-	-	-	2,250
Sodium absorption ratio	max	-	-	-	-	26
Boron	mg/l	-	-	-	-	2

Appendix 4: AIIB's Environmental and Social Exclusion List

Appendix 5: Environmental and Social Site Screening Checklists

1. Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Dhing

Date of Site Visit	05.07.2023
Location	Dhing, Nagaon, Assam
GPS Coordinates	N 26.47864 E 92.46988

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting; Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine	Yes		A Beel named Lettriebeel is located adjacent to the proposed land.
4. Special area for protecting biodiversity		No	No such special area observed
B. Potential Environmental Impacts; Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	May be attributed to the presence of a Beel/River channel adjacent to the land.
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	Yes		
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)		No	Not applicable for this project
8. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		No	Not applicable for this project
9. Improper sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	Yes		Inadequate sanitation facilities in construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food,

Particulars	Yes	No	Remarks
			contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: • Job competition • Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks • Air pollution • Water contamination • Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that

Particulars	Yes	No	Remarks
			should be considered: • Construction and Demolition Waste • Equipment Waste • Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

Note: -

- *No trees required to be felled except clearing of shrubs and bamboo clumps.*
- *Demolition of abandoned structures may be required.*
- *A Beel named Lettriebeel is located adjacent to the proposed land.*
- *Utility structures like water pipes and poles needs to be removed.*

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	Assam Industrial Development Corporation Land (Government)
3. Does the project require acquisition of land or transfer of Govt. land/structures?	Transfer of Govt. land is on process.
4. If yes please mention the area of land, number of affected structures, Households	15 bighas; the land has noencroachers/squatters.
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	The proposed land is unused and vacant land.
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No (land is encumbrances free)
12. Does the project require relocation of community facilities/Govt. establishment or any object that are of religious, cultural and historical significance?	No
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	No

Particulars	Observation
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	May occur during construction
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No negative impact anticipated
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; further risk will be minimized through standard safety norms
23. Other social concerns relating to inconveniences in living conditions in the project areas?	No
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected by the proposed project development and how?	No
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	Not required for the Substation
28. Describe any other impacts that have not been covered in this screening form	Not applicable
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands.	Not applicable

C. Photographs of Site Visit and Community Consultation at 132/33kV Dhing S/S

Community Consultation at 132/33kV Dhing S/S

2. Establishment of New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara

Date of Site Visit	03.08.2023
Location	Dhupdhara, Goalpara, Assam
GPS Coordinates	N 26.033679 E 91.071151°

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting; Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine		No	However, Low Lying Area with presence of water bodies such as ponds near the proposed land
4. Special area for protecting biodiversity		No	
B. Potential Environmental Impacts Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	May be attributed to the proposed land is a of Low laying area
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	Yes		May affect the nearest agriculture land
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)		No	Not applicable for this project
8. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		No	Not applicable for this project

Particulars	Yes	No	Remarks
9. Improper sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	Yes		Inadequate sanitation facilities in construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: • Job competition • Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks • Air pollution

Particulars	Yes	No	Remarks
			• Water contamination • Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that should be considered: • Construction and Demolition Waste • Equipment Waste • Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	Govt. land
3. Does the project require acquisition of land or transfer of Govt. land/structures?	The land possession is transferred from AIDC (Govt. land) to AEGCL
4. If yes please mention the area of land, number of affected structures, Households	25 bigha (The land is free from encumbrances and no encroachers and squatters was found)
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	Unused/vacant land
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No
8. Will the project cause damage to private property/assets?	No

Particulars	Observation
(structures, crops, trees, etc.)	
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No loss of livelihood
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No encroachers or squatters was found.
12. Does the project require relocation of community facilities/Govt. establishment or any object that are of religious, cultural and historical significance?	No.
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	Not required
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No negative impact on the vulnerable group
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	No
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; farther risk will be minimized through following standard safety norms & E&S legal operation frameworks.
23. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected by the proposed project development and how?	Not affected
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No IPP is required for sub-station site.
28. Describe any other impacts that have not been covered in this screening form	For Transmission line route if Indigenous population get affected will require FPIC and IIP.
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	Govt. land procured for the proposed S/S location.

C. Photographs of the proposed Dhupdhara site

Proposed Dhupdhara site

3. Establishment of New 132/33 kV (2 X50 MVA) AIS Substation at Morigaon

Date of Site Visit	05.07.2023
Location	Morigaon, Assam
GPS Coordinates	N 26.14619 E 92.35127

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting: Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine		No	The proposed land is a low-lying area
4. Special area for protecting biodiversity		No	
B. Potential Environmental Impacts Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	May be attributed to the proposed land is a of Low laying area
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	Yes		May affect the nearest agriculture land
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)		No	Not applicable for this project
8. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		No	Not applicable for this project
9. Improper sanitation and solid	Yes		Inadequate sanitation facilities in

Particulars	Yes	No	Remarks
waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?			construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: Job competition Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks • Air pollution

Particulars	Yes	No	Remarks
			• Water contamination • Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that should be considered: Construction and Demolition Waste Equipment Waste Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

Note: -

- Presence of agricultural land near the site.
- Tree cutting/clearance of vegetation is required.
- Utilities: Presence of 132kV tower with a D/C Line within the land, and 2 nos. newly constructed 33kV four-pole.

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	Govt. land
3. Does the project require acquisition of land or transfer of Govt. land/structures?	ASEB land has been transferred to AEGCL
4. If yes please mention the area of land, number of affected structures, Households	15 bighas, 2 Katha and 10 Lessa. The land is free from encumbrances and no encroachers / squatters was found.

Particulars	Observation
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	Unused/vacant land
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No loss of livelihood
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No encroachers or squatters was found.
12. Does the project require relocation of community facilities/Govt. establishment or any object that are of religious, cultural and historical significance?	No.
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	Not required
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No negative impact on the vulnerable group
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	No
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; further risk will be minimized through standard safety norms.
23. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected	Not affected

Particulars	Observation
by the proposed project development and how?	
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No IPP is required for sub-station site.
28. Describe any other impacts that have not been covered in this screening form	For Transmission line route if Indigenous population get affected will require FPIC and IIP.
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	ASEB land procured for the proposed S/S location with no encroacher/ squatters.

C. Photographs of Site Visit and Community Consultation

Proposed Morigaon Site

Proposed Morigaon Site

Public Consultation at Morigaon Site

4. Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Serfanguri

Date of Site Visit	01.08.2023
Location	Serfanguri, Kokrajhar, Assam
GPS Coordinates	N 26.545677 E 90.143410

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting: Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit. (Ganga mandir present North side of the proposed land)
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine	Yes		A Nala (drainage) is present in north side near the proposed land.
4. Special area for protecting biodiversity		No	No such special area observed
B. Potential Environmental Impacts Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	May be attributed to the presence of a Beel/River channel adjacent to the land.
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	Yes		
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)		No	Not applicable for this project
8. Disproportionate impacts on the poor, women and children,		No	Not applicable for this project

Particulars	Yes	No	Remarks
Indigenous Peoples or other vulnerable groups?			
9. Improper sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	Yes		Inadequate sanitation facilities in construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: • Job competition Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks • Air pollution

Particulars	Yes	No	Remarks
			• Water contamination • Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that should be considered: • Construction and Demolition Waste • Equipment Waste • Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

Note: -

- No environmentally sensitive areas, protected areas, cultural heritage sites are present within the vicinity of the proposed land.
- No trees required to be felled except clearing of shrubs.
- *River Hel* is flowing approximately 1.3 km away from the proposed site.
- No utility structures found at the site.

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	Govt. land
3. Does the project require acquisition of land or transfer of Govt. land/structures?	Govt. Khas land has been transferred to AEGCL
4. If yes please mention the area of land, number of affected structures, Households	25 bighas. The land is free from encumbrances and no encroachers / squatters was found.

Particulars	Observation
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	Unused/vacant land
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No loss of livelihood
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No encroachers or squatters was found.
12. Does the project require relocation of community facilities/Govt. establishment or any object that are of religious, cultural and historical significance?	No.
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	Not required
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No negative impact on the vulnerable group
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	No
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; further risk will be minimized through standard safety norms.
23. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected	Not affected

Particulars	Observation
by the proposed project development and how?	
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No IPP is required for sub-station site.
28. Describe any other impacts that have not been covered in this screening form	For Transmission line route if Indigenous population get affected will require FPIC and IIP.
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	Govt. land procured for the proposed S/S location with no encroacher / squatters.

C. Photographs of Site Visit and Community Consultation at Serfanguri Site

Proposed site Serfanguri S/S and public consultation

5. Establishment of New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor

Date of Site Visit	04.07.2023
Location	Titabor, Jorhat, Assam
GPS Coordinates	N 26.615292 E 94.251088

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting: Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine		No	Only rain water drainage channel passing through the location
4. Special area for protecting biodiversity		No	No such special area observed
B. Potential Environmental Impacts Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	May be attributed to the presence of a drainage system passing adjacent to the land during the monsoon period.
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	Yes		
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)		No	Not applicable for this project
8. Disproportionate impacts on		No	Not applicable for this project

Particulars	Yes	No	Remarks
the poor, women and children, Indigenous Peoples or other vulnerable groups?			
9. Improper sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	Yes		Inadequate sanitation facilities in construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: • Job competition • Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks

Particulars	Yes	No	Remarks
construction and operation?			• Air pollution • Water contamination • Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that should be considered: • Construction and Demolition Waste • Equipment Waste • Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

Note: -

- *No trees required to be felled except clearing of shrubs.*
- *Utility structures like steel poles needs to be shifted from the site.*
- *Hilikha Tea Estate is located within the vicinity of the proposed site.*

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	Private Tea Garden land. (M/s Lettekojan TE)
3. Does the project require acquisition of land or transfer of Govt. land / structures?	Yes, Tea Garde land has been transferred to AEGCL.
4. If yes please mention the area of land, number of affected structures, Households	9 bighas. The land is free from encumbrances, no encroachers / squatters and no structures were found.

Particulars	Observation
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	Unused/vacant land within the Tea Garden.
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No loss of livelihood anticipated
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No encroachers or squatters was found.
12. Does the project require relocation of community facilities/Govt. establishment or any object that are of religious, cultural and historical significance?	No.
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	Not required (land compensation will be made as per Govt. norms.
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No negative impact on the vulnerable group
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	No
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; further risk will be minimized through standard safety norms.
23. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected	Not affected

Particulars	Observation
by the proposed project development and how?	
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No IPP is required for sub-station site.
28. Describe any other impacts that have not been covered in this screening form	For Transmission line route if Indigenous population get affected will require FPIC and IIP.
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	Tea Garden land procured for the proposed S/S location with no encroacher / squatters.

C. Photographs of Site Visit and Community Consultation

Public Consultation at proposed Titabor S/S

6. Establishment of New 132/33 kV (2 X 160 MVA) GIS Substation at Rowta

Date of Site Visit	09.05.2023
Location	Rowta, Udalguri, Assam
GPS Coordinates	26°43'25.44"N 92°11'22.17"E

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting: Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine		No	
4. Special area for protecting biodiversity		No	No such special area observed
B. Potential Environmental Impacts Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		No	
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)		No	No displacement of people
8. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other		No	Not applicable for this project

Particulars	Yes	No	Remarks
vulnerable groups?			
9. Improper sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	Yes		Inadequate sanitation facilities in construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: • Job competition • Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks

Particulars	Yes	No	Remarks
construction and operation?			• Air pollution • Water contamination • Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that should be considered: • Construction and Demolition Waste • Equipment Waste Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

Note: -

- Some trees may be required to be felled.
- Demolition of abandoned structures may be required.
- Utility structures like water pipes and electric poles needs to be removed.

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	AEGCL existing land.
3. Does the project require acquisition of land or transfer of Govt. land/structures?	Not applicable as the proposed S/S will be constructed in AEGCL existing land.
4. If yes please mention the area of land, number of	29 bighas.

Particulars	Observation
affected structures, Households	The land is free from encumbrances and no encroachers / squatters was found.
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	Unused land with 2-3 abandoned AEGCL existing quarters
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No loss of livelihood
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No encroachers or squatters was found.
12. Does the project require relocation of community facilities/Govt. establishment or any object that are of religious, cultural and historical significance?	No.
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	Not required
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No negative impact on the vulnerable group
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	No
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; further risk will be minimized through standard safety norms.
23. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience

Particulars	Observation
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected by the proposed project development and how?	Not affected
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No IPP is required for sub-station site.
28. Describe any other impacts that have not been covered in this screening form	For Transmission line route if Indigenous population get affected will require FPIC and IIP.
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	AEGCL existing land will be used for the proposed Rowta S/S with no encroacher / squatters.

C. Photographs of Site Visit and Community Consultation

Discussed with the officials of Depota Division, AEGCL for proposed Rowta S/S

7. Establishment of New 132/33 kV (2 X 50 MVA) GIS Substation at Lumding

Date of Site Visit	10.05.2023
Location	Lumding, Hojai, Assam
GPS Coordinates	25°45'14.38"N, 93°08'58.73"E

A. Environmental Screening Checklist

Particulars	Yes	No	Remarks
A. Project Siting; Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
1. Cultural heritage site		No	No cultural heritage was found during the visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected zone was noticed
3. Wetland/ Mangrove/ Estuarine		No	The proposed land is in a hillock, no wetland is nearby.
4. Special area for protecting biodiversity		No	
B. Potential Environmental Impacts Will the Project cause?			
1. Impairment of historical/cultural areas; disfiguration of landscape or potential loss/damage to physical cultural resources?		No	
2. Disturbance to precious ecology (e.g. sensitive or protected areas)?		No	
3. Alteration of surface water hydrology of waterways resulting in increased sediment in streams affected by increased soil erosion at construction site?		No	May be attributed to the proposed land is a of Low laying area
4. Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	Yes		May affect the nearest agriculture land
5. Increased air pollution due to project construction and operation?	Yes		Emissions from Machinery: Construction activities often involve the use of heavy machinery such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter (PM), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to project construction or operation?	Yes		Various construction activities like drilling, hammering and concrete mixing can produce loud noises.
7. Involuntary resettlement of people? (Physical displacement and/or Economic displacement)	Yes		Only one private land will be acquired by direct purchase as per the act, following with proper entitlement matrix.
8. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		No	Not applicable for this project

Particulars	Yes	No	Remarks
9. Improper sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	Yes		Inadequate sanitation facilities in construction camps and work sites can lead to various health issues. Without proper toilets or sanitation systems, workers may resort to open defecation or use makeshift facilities, increasing the risk of fecal contamination. This contamination can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhea, cholera, typhoid, and hepatitis A.
10. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Yes		Mosquitoes and rodents are vectors for various diseases, and their control is essential to prevent the spread of these diseases. Instead of creating breeding habitats, it is advisable to focus on strategies that reduce or eliminate their presence and breeding opportunities.
11. Social conflicts if workers from other regions or countries are hired?	Yes		Although it largely depends on the specific context, cultural factors, and the manner in which the hiring is carried out. Here are a few potential social conflicts that may arise: • Job competition Wage and labor conditions
12. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (Such as water supply and sanitation systems)?	Yes		A large population influx can affect social infrastructure and services related to water supply and sanitation: • Water Demand • Sanitation Systems • Infrastructure Capacity • Environmental Impact
13. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and Electromagnetic hazards during project construction and operation?	Yes		**Physical Hazards:** • Falls from heights • Struck-by accidents • Caught in-between accidents • Electrocution **Chemical Hazards:** • Exposure to toxic substances • Hazardous material spills **Biological Hazards:** • Infectious diseases • Vector-borne diseases • Electromagnetic Radiation
14. Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	Yes		During construction and operation activities can pose various risks to community health and safety: • Accidents and explosions • Chemical spills and leaks • Air pollution • Water contamination

Particulars	Yes	No	Remarks
			• Occupational hazards • Noise pollution • Waste generation
15. Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	Yes		It is essential to identify and mitigate these risks to ensure the well-being of the community. To address these risks, it is crucial to engage in comprehensive risk assessments, involve relevant experts and stakeholders, adhere to applicable safety regulations and standards.
16. Generation of solid waste and/or hazardous waste?	Yes		However, there are a few potential sources of waste associated with electrical substations that should be considered: • Construction and Demolition Waste • Equipment Waste • Maintenance Waste
17. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulfur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
18. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

Note: -

- *Some trees may be required to be felled.*

B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project (for Substation)	Yes
2. Landownership of the project area: Govt. / Private lands	Government land
3. Does the project require acquisition of land or transfer of Govt. land/structures?	Government land has been transferred to AEGCL.
4. If yes please mention the area of land, number of affected structures, Households	8 bighas. The land is free from encumbrances and no encroachers / squatters was found.
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	Unused/vacant land.
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No

Particulars	Observation
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No
9. Will the project lead to loss of common property resources?	No
10. Will the project lead to loss of livelihood – directly or indirectly?	No loss of livelihood for S/S site. However, for development of the approach road of the S/S, 1 katha 16 lessa of private land has been acquired and compensation paid as per Govt. norms.
11. Does the project require relocation of encroachers / squatters? If yes, please elaborate number and nature, if possible.	No encroachers or squatters was found.
12. Does the project require relocation of community facilities / Govt. establishment or any object that are of religious, cultural and historical significance?	No.
B. Potential Social Impacts- Will the Project cause	
13. involuntary resettlement of people? (physical displacement and/or economic displacement)	Not required
14. Impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No negative impact on the vulnerable group
15. Will community facilities require relocation?	No
16. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	No
17. Social conflicts relating to inconveniences in living conditions where construction interferes with preexisting roads	No
18. Will a resettlement Action Plan be required?	No
19. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
20. Livelihood- Direct impact due to loss of land and structures?	Nil
21. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
22. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; further risk will be minimized through standard safety norms.
23. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
24. Social concerns relating to local inconveniences associated with project operation, if any? (e.g. increased volume of traffic, greater risk of accidents, communicable disease transmission)	Not anticipated any such inconvenience
25. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
26. Which are the economic activities of IP will be affected by the proposed project development and how?	Not affected
27. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No IPP is required for sub-station site.

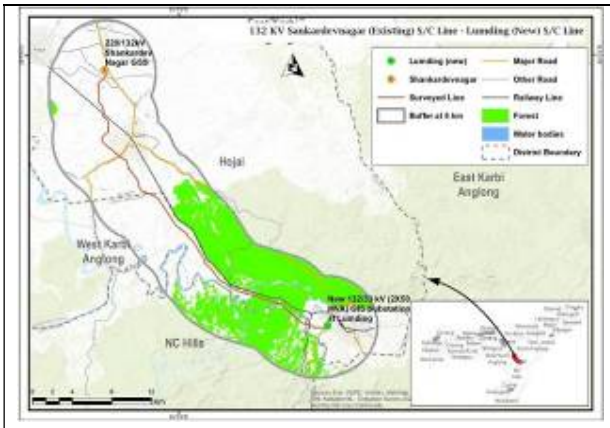
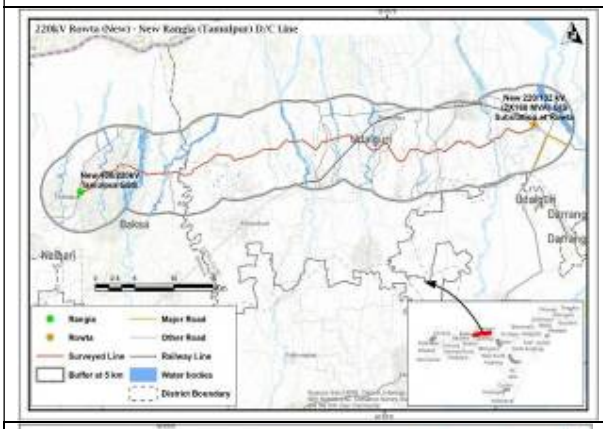
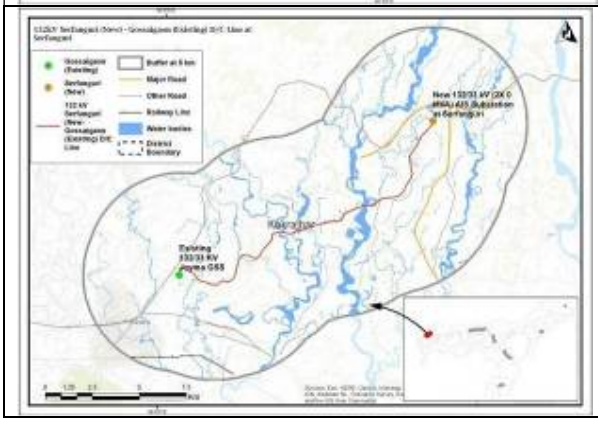
Particulars	Observation
28. Describe any other impacts that have not been covered in this screening form	For Transmission line route if Indigenous population get affected will require FPIC and IIP.
29. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	Government land will be used for the proposed Lumding S/S with no encroacher / squatters.

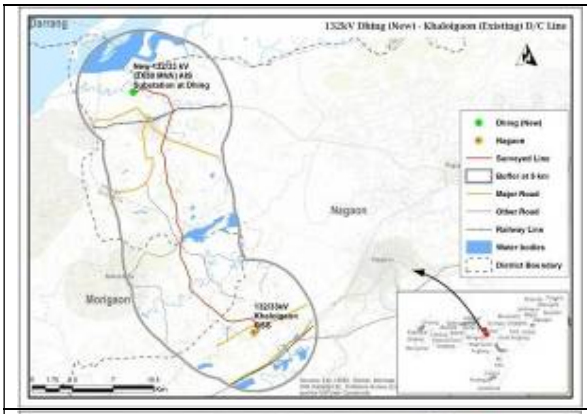
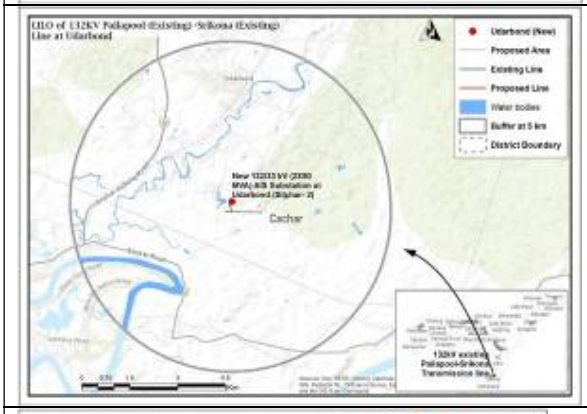
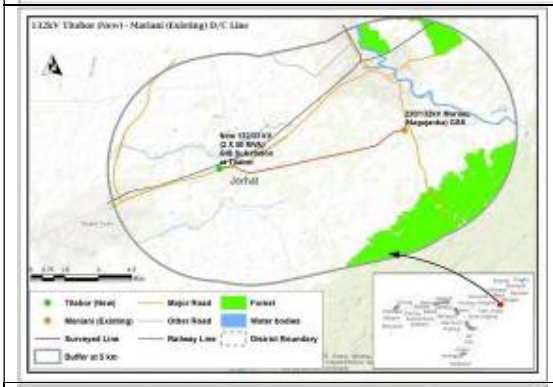
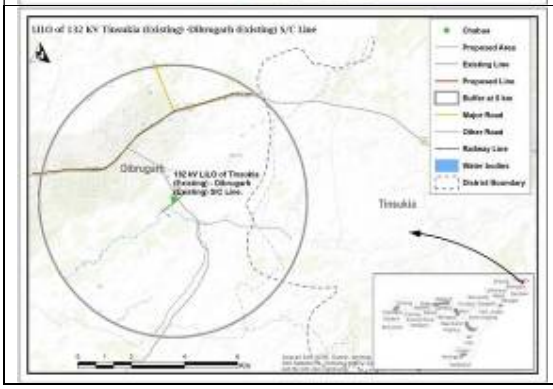
C. Photographs of Site Visit and Community Consultation

Proposed site for Lumding S/S

Community Consultation at proposed Lumding Site

Appendix-6: GIS Analysis: Proposed Substation Locations and Surveyed Transmission Line Routes

	**1. Establishment of New 132/33 kV (2 X 50 MVA) GIS Substation at Lumding** *Associated Transmission Line*: 132 kV Shakardevnagar (Existing) S/C Line – Lumding (New) S/C Line at Lumding (Approx. 10KM) **Assessment Outcome:** The proposed substation site is situated within 5 km of Lumding Reserve Forest and LungtingMupa Reserve Forest. A segment measuring 6.36 kilometers of the intended route traverses Lumding Reserve Forest and LungtingMupa Reserve Forest. The request for forest clearance has been submitted to PARIVESH, Ministry of Environment, Forest and Climate Change (MoEF&CC) on 19th December 2023. The In Principle approval (Stage-1) of the proposal was received on 30th Jan 2024 and the Final approval (Stage-2) is under process.
	**2. Establishment of New 132/33 kV (2 X 160 MVA) GIS Substation at Rowta** *Associated Transmission Line*: 220 kV Rowta (New) - New Rangia (Tamulpur) D/C Line (Approx. 80 KM) **Assessment Outcome**: The proposed substation and transmission line route do not pass through any Protected Areas.
	**3. Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Serfanguri** *Associated Transmission Line*: 132 kV Serfanguri (New) - Gossaigaon (Existing) D/C Line (Approx. 18KM) **Assessment Outcome**: The proposed substation and transmission line route are not located in the vicinity of any Protected Areas.

	**4. Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Dhing** *Associated Transmission Line*: 132 kV Dhing (New) - Nagaon (Existing) S/C Line (Approx. 35 KM) **Assessment Outcome:** The proposed substation and transmission line route do not pass through any Protected Areas.
	**5. Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Udarbond (Silchar-2)** *Associated Transmission Line*: PGCIL to 132/33kV Srikona SS (AEGCL) **Assessment Outcome:** The proposed substation and transmission line route are not located in the vicinity of any Protected Areas.
	**6. Establishment of New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor** *Associated Transmission Line*: 132 kV Titabor (New) - Mariani (Existing) D/C Line (Approx. 20KM) **Assessment Outcome**: The proposed substation and transmission line route do not pass through any Protected Areas.
	**7. Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Chabua** *Associated Transmission Line*: 132 kV LILO of Tinsukia (Existing) - Dibrugarh (Existing) S/C Line (Approx. 8KM) **Assessment Outcome**: The proposed substation and transmission line route are not in the vicinity of any Protected Areas.

Appendix 7: Biodiversity Action Plan

1. Background

Electricity lines are vital infrastructure for modern society but can have significant impacts on biodiversity. A comprehensive biodiversity assessment framework is essential to identify, mitigate, and manage these impacts. Biodiversity, encompassing the entirety of biological diversity, ecological and evolutionary processes, natural ecosystems, wild species, agricultural ecosystems, and domesticated varieties, forms the core of Assam's natural heritage. Situated in Northeast India, Assam serves as the ***"Bio-geographic Gateway"*** to the Indo-Burmese hotspot, lying at the intersection of the Indian Subcontinent and the Indo-China Bio-geographic regions. This unique positioning endows Assam with remarkable genetic diversity and distinct Indo-Malayan and Indo-Chinese characteristics making Assam as "Biological Gateway" of the region with abundance of flowering plants due to its remarkable floristic abundance.

The country's economic activities are critically dependent on energy resources. Electrical transmission lines are an essential part of India's development as it transmits and distributes power to domestic as well as industrial sectors. India has set an ambitious target of generating 1459.373 BU in the year 2022-23. Even with the current trend of technological progress, there is no cost-effective and technologically feasible way of storing electrical energy and therefore electricity needs to be carried long distances at high voltages. Transmission of electricity at low voltages leads to very high losses (transmission and distribution losses) of power. It is therefore imperative that with increased installed capacity of power generation there is also a network for efficient transmission.

However, it is necessary to ensure that any proposed infrastructure development activity in the vicinity or adjacent to any protected area needs to be carried out without compromising the long-term value of natural areas, their ecosystem services, and imperilling the prospects for more holistic development. The impacts of construction of power transmission lines on wildlife and other environmental resources is generally a matter of concern, since it usually requires the removal of a large number of trees when the transmission lines are passing through forest area. Further, some other issues that tend to come into prominence include mortality of birds due to collision and subsequent electrocution, fragmentation of forest patches, breaks in wildlife movement corridors etc. Such fragmentation alters the microclimate, isolates habitat patches and increases edge effects. However, the effects related to erection and operation of transmission lines in protected areas will not be as severe as those caused by broad and wide clear-felled areas in other types of projects since clearing of vegetation is limited in a corridor of 35 m.

In the context of above and as part of statutory requirements and activity in the reserved forest area, the **Biodiversity Impact Assessment study** is conducted in order to minimize the impact on biodiversity values through implementation of suitable mitigation measures for identified impacts. The study will involve field assessments, stakeholder consultations and a review of existing literature. It will focus on evaluating the floral and faunal diversity of the region and identifying any threatened species present. Additionally, the study will assess the potential impacts on biodiversity within the buffer zone due to the proposed transmission line, aiming to develop a list of possible mitigation measures.

2. Project Description

Assam Electricity Grid Corporation Limited (AEGCL) is a dynamic, growth-oriented public sector company registered under the Company Act of 1956. Formed from the restructured Assam State

Electricity Board in 2003, AEGCL was notified as the State Transmission Utility (STU). Its core mission is to transport electrical power efficiently from bulkheads to distribution networks across Assam.

At its inception in 2003, AEGCL inherited 3,862 circuit kilometers of Extra High Voltage (EHV) lines above the 66 kV voltage class and 38 EHV substations with a total transmission capacity of 1,636.50 MVA. Today, AEGCL operates with a transmission capacity of about 7,583 MVA, a line length of 5,784 kilometers, and 71 substations, which include 1 at 400 kV, 12 at 220 kV, and 58 at 132 kV.

AEGCL is committed to delivering electricity efficiently and economically, adhering to safety standards, and respecting environmental, social, and heritage issues. In alignment with the Government of India's Sustainable Development Goal (SDG-7) for "Affordable and Clean Energy for All," AEGCL aims to enhance its power transmission infrastructure to ensure "Power for All" (PFA).

To achieve its vision, the Government of Assam, with support from the Government of India and the Asian Infrastructure Investment Bank (AIIB), has launched the "Assam Intra-State Transmission System Enhancement Project (AISTSEP)." The project's primary objective is to elevate the power sector within Assam, addressing transmission network constraints and congestion. Key goals include:

- Implementing an action plan to handle peak power of 6,500 MW by 2030 through the addition of 48 new EHV substations and 4,607 circuit kilometers of transmission lines.
- Enhancing capacity by 4,272 MW by FY 2024–25.
- Investing INR 9,510.00 Crore to add 4,096 MW and achieve a total of 7,176 MW transmission capacity.

Phase II focuses on expanding the state's electricity transmission capacity through the construction of 14 new 220 kV and 132 kV GIS and AIS substations, along with associated transmission lines and complementary infrastructure. The project's total expenditure is approximately USD 490 million, with AIIB providing financial support of USD 304 million for Phase I and USD 186 million for Phase II.

Transmission line route selection

For selection of optimum line route, the following points are generally taken into consideration;

- The route of the proposed transmission lines does not involve any human resettlement and rehabilitation;
- Any monument of cultural or historical importance is not affected by the route of the transmission line;
- The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community;
- The proposed route of transmission line does not affect any public utility services like play grounds, schools, other establishments etc.;
- The line route does not pass through any Sanctuaries, National Park etc.;
- The line route does not infringe with area of natural resources.

AEGCL Project Context for Biodiversity and Wildlife Conservation & Management Plan

The 14 sub-projects under the proposed AIIB funding/loan have been identified, as the final project sites. The final alignment of the transmission lines are yet to be confirmed through IBAT survey for proposed alignments have been carried out. Therefore, an Environmental and Social Management Planning Framework (ESMPF) is being developed to ensure that the sub-projects will be assessed and implemented in conformity with AIIB's ESP.

Design Specifications and Area of Influence of the Transmission Line

Impact of transmission line is not far reaching and mostly localized to RoW.

Key Construction Related Activities

As per the project requirements

Legal Context of the Study

Forest (Conservation) Act, 1980: When transmission projects pass through forestland, clearance has to be obtained from relevant authorities under the Forest (Conservation) Act, 1980. This act was enacted to prevent rapid deforestation and environmental degradation. State governments cannot de-reserve any forestland or authorise its use for any non-forest purposes without approval from the Central Government. However, out of 14 substation and transmission lines only one proposed substation name New 132/33 kV (2X50 MVA) GIS Substation, Lumding, falls within 5 km radius of 3 nos. of KBA Sites, namely LangtingMupa RF, Lumding Reserve Forest and Lumding Marat Longri Wildlife Sanctuary and the associated transmission line name 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding has a stretch of 6.36 km which passes through Lumding Reserve forest.

Wildlife (Protection) Act, 1972: Since the proposed substation name New 132/33 kV (2X50 MVA) GIS Substation, Lumding, and transmission line name 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding will pass through Lumding Reserve Forest, it will require clearance under Section-29 of Wildlife (Protection) Act, 1972,from MoEF&CC. A set procedure needs to be followed for diverting parts of protected areas for laying transmission line. A proposal will be processed through State Board for Wildlife and National Board for Wildlife. Both the boards will see to the merits of the case and provide their judgments based on the scale and types of impacts it will exert on protected areas.

Why Biodiversity Impact Assessment?

Biodiversity impact assessment can be defined as a decision support tool to help biodiversity inclusive development planning and implementation. It aims at ensuring that development proposals integrate biodiversity considerations and are legally compliant, and it includes mechanisms for the conservation of biodiversity (with the aim of no net loss of biodiversity), resulting sustainable use of biodiversity resources, and provide fair and equitable sharing of the benefits arising from use of biodiversity. The overall objective of the biodiversity assessment is to optimize the impact of developmental projects on local biodiversity and ecosystem. It is also to assess the current state of biodiversity in the proposed area of development and values (economic and social) of existing biodiversity and ecosystem. It can also help to understand the extent of damages that might occur due to certain developmental (infrastructure) activities in the area and its potential mitigation measures. The need to consider the impacts on biodiversity during infrastructure planning and decision-making has been emphasized in some multination agreements such as the Convention on Biological Diversity (CBD, 2005, p. 720 737) and is part of the legal framework of nearly every country (Morgan, 2012). As for numerous other infrastructures, this creates the need for a reasoned evaluation of the environmental viability of the transmission lines during the environmental licensing process. Biodiversity Impact Assessment (BIA) helps in introducing biodiversity concerns into conceptual stages of planning, it achieves the integration needed to spur innovative solutions which place biodiversity conservation, sustainable use, and equitable sharing at the core of planning processes.

As per AIIB's Environmental and Social Framework (Amended February 2019 and May 2021), C. Environmental Coverage (Refer Sl. No. 28 to 35), Sl. No. 34. It is mandatory to conduct biodiversity surveys for impact assessment and mitigation for all the sites. As per Government of India, as per guidelines for seeking recommendations of Standing Committee of National Board for Wild Life for activities in protected areas, MoEF&CC GoI, dated 6th May 2022, "Proposals for use of an area exceeding 50 ha within a sanctuary/national park shall be accompanied with a bio-diversity impact assessment study report and it suggested mitigation measures prepared by an agency accredited by the Government of India" however it is compulsory to make management plan for areas under transmission line "Proposals for transmission lines shall be accompanied with a management plan for the area below the transmission line. The management plan should prescribe the species to be planted and maintained below the transmission line, periodicity of maintenance etc.".

Legal and Regulatory Aspects

Environment Protection Rules, 1986 and applicable standards Section 7: Persons carrying on industry, operations, etc., not to allow emission or discharge of environmental pollutants in excess of the standards.

Section 9(1): Where the discharge of any environmental pollutant in excess of the prescribed standards occurs or is apprehended to occur due to any accident or other unforeseen act or event, the person responsible for such discharge and the person in charge of the place at which such discharge occurs or is apprehended to occur shall be bound to prevent or mitigate the environmental pollution caused as a result of such discharge and shall also forthwith a) Intimate the fact of such occurrence or apprehension of such occurrence; and b) Be bound, if called upon, to render all assistance, to such authorities or agencies as may be prescribed.

Section 15: Penalty for contravention of the provisions of the Act and the rules, orders and directions.
(1) Whoever fails to comply with or contravenes any of the provisions of this Act, or the rules made or orders or directions issued there under, shall, in respect of each such failure or contravention, be punishable with imprisonment for a term which may extend to five years or with fine which may extend to one lakh rupees, or with both, and in case the failure or contravention continues, with additional fine which may extend to five thousand rupees for every day during which such failure or contravention continues after the conviction for the first such failure or contravention.
(2) If the failure or contravention referred to in sub-section (1) continues beyond a period of one year after the date of conviction, the offender shall be punishable with imprisonment for a term which may extend to seven years.

Forest Conservation Act, 1980

This Act mandate prior permission of the Forest Department for any activity which is to be undertaken on forest land. The provision of conversion of forest land for non-forest purpose are specified under this Act.

Forest Conservation Rules, 2003

Transmission through bare conductor(s): As a general principle, where routing of transmission lines through the forest areas is unavoidable, these should be aligned in such a way that it involves the least number of trees cutting, and as far as possible, the route alignment through forest areas should not have any line deviation.

In case of the demand for reduction in the width of Right of Way (RoW) of transmission lines in forest areas in the cases where Aerial Bunched Cable (ABC) are used in place of overhead lines, it is clarified that as per definitions in Measures relating to Safety and Electric Supply, Regulations, 2010 conductor is defined as bare or insulated and as such the vertical & horizontal clearance specified in Regulation 61have to be maintained for both bare and insulated conductors like ABC etc.

Compensatory afforestation (CA) and Net Present Value (NPV) will be regulated as per the concerned guidelines.

3. Project Area

General Profile of study area

India is one of the 17 mega bio-diverse countries in the world and accounts for 7.8% of the recorded species. Assam's diverse altitudinal variations and unique climatic conditions give rise to a multitude of ecosystems, including wet evergreen forests, moist deciduous forests, wet savannahs, riparian forests, swamps, marshes, wetlands, and river systems. These varied habitats collectively maintain a rich gene pool that supports a wide array of flora and fauna. The state's forests cover approximately 26,832 square kilometers, constituting 34.21% of its geographical area, with reserved and unclassed forests comprising 66.58% and 33.42% of this area, respectively (FSI, 2021).According to Champion and Seth Classification, the state has 18 forest types belonging to five forest type groups viz.

- Tropical Wet Evergreen
- Tropical Semi Evergreen
- Tropical Moist Deciduous
- Tropical Dry Deciduous
- Sub-Tropical Pine Forests

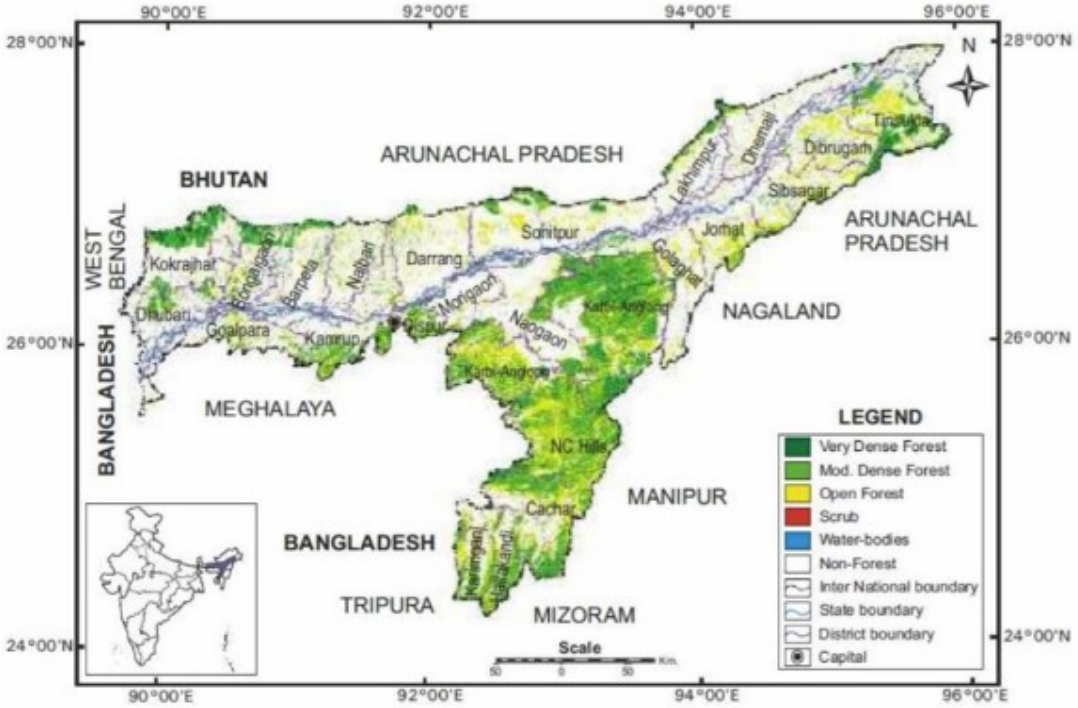


Figure: Green Cover in Assam

Baseline Information

Biodiversity, encompassing the entirety of biological diversity, ecological and evolutionary processes, natural ecosystems, wild species, agricultural ecosystems, and domesticated varieties, forms the core of Assam's natural heritage. Situated in Northeast India, Assam serves as the ***"Bio-geographic Gateway"*** to the Indo-Burmese hotspot, lying at the intersection of the Indian Subcontinent and the Indo-China Bio-geographic regions. This unique positioning endows Assam with remarkable genetic diversity and distinct Indo-Malayan and Indo-Chinese characteristics making Assam as "Biological Gateway" of the region with abundance of flowering plants due to its remarkable floristic abundance.

Protected Area Network (PAN)

Assam's Protected Area Network (PAN) occupies 5,272.595 square kilometers, about 5% of the state's geographical area, and provides vital habitats for rare and endangered species such as the Golden Langur and the one-horned rhinoceros. It plays a crucial role in the in-situ conservation of biodiversity. The PAN includes:

- 7 National Parks
- 22 Wildlife Sanctuaries
- 3 Proposed Wildlife Sanctuaries
- 3 Tiger Reserves (Manas, Nameri, Kaziranga)
- 5 Elephant Reserves
- 2 Biosphere Reserves
- 2 World Natural Heritage Sites

Biodiversity Profile of study area

Assam is recognized for its ecological diversity and the range of floral and faunal species. It is part of the Eastern Himalayan Biodiversity Region, one of India's two biodiversity hotspots, and belongs to one of the 25 mega diverse regions on the planet. The Eastern Himalaya and the Assam plains have been identified as an Endemic Bird Area by the Royal Society for Protection of Birds, (Bibby et al.1992). The dense forest as well as extensive network of river systems, swamps, marshes and wetlands provides ideal conditions for sustenance of wide variety of fauna in Assam. Assam is home to numerous threatened plant species recognized by the IUCN, with 284 species observed to be critically endangered, 149 species endangered, 58 species vulnerable, and 13 species near threatened.

Assam's Protected Area Network (PAN) occupies 3925 km^2, about 5% of the state's geographical area, and provides vital habitats for rare and endangered species such as the Golden Langur and the one-horned rhinoceros. It plays a crucial role in the in-situ conservation of biodiversity. The PAN includes7 National Parks, 22 Wildlife Sanctuaries, 3 Proposed Wildlife Sanctuaries, 3 Tiger Reserves (Manas, Nameri, Kaziranga), 5 Elephant Reserves, 2 Biosphere Reserves and 2 World Natural Heritage Sites.

Mammalian diversity: A total of 193 species of mammals are found in Assam viz. Great Indian OneHorned Rhinoceros, Tiger, Bears, Squirrel, Wild Asiatic Water Buffalo, Eastern Swamp Deer, Elephants, Gaur, Sambar, Indian Muntjac, Wild Boar, Hog Deer, Jungle Cat, LeopardCat, Hispid Hare (rare), Indian Grey Mongoose, Small Indian Mongooses, Large Indian Civet, Small Indian Civets, Bengal Fox, Golden Jackal, Sloth Bear, Indian Pangolins, Chinese Pangolin, Hog Badger, Chinese Ferret

Badgers, Parti-coloured Flying Squirrel, Gangetic Dolphin, Wild Pig, PigmyHog, Barking Deer, Himalayan Black Bear, Porcupine, Burmese Ferret Badger, Sloth Bear, Wild Dog (Dhole), Leopard, Clouded Leopard, Binturong, Golden Cat, Himalayan Palm Civet, Common Palm Civet, Fishing Cat, Feral Horses, Marbled cat, Golden cat, Spotted linsang, Binturong, Crab eating mongoose, Ferret badger, Hog badger, Hoary bamboo rat, Bay bamboo rat, Clawless otter, Stone marlin.

Primate diversity: A total of 9 primate species out of 15 are found in Assam. Hoolock gibbon is theonly ape found in India. The other primate species are golden langur, capped monkey, rhesus macaque,pigtail macaque, stump tailed macaque, Assamese macaque, and slow Lorries.

Avian Diversity: Assam is home for about 950 bird species. Out of which 17 species of birds are endemic to Assam and include Manipur Bush Quail, Marsh Babbler, Snowy throated Babbler, Tawny breasted Wren Babbler, Blyth's Tragopan, Beautiful Sibia, Grey Sibia, Black Breasted Parrotbill, Chestrunt Breasted Partridge, Rusty Breasted Short wig etc. A total of 45 species of birds are listed in Indian Red Data Book.

Reptilian Diversity: A total of 116 reptile species are found in Assam viz. Gangetic gharial, 19 species of tortoises and 77 species of snakes and lizards are found in the State.

Amphibian Diversity: Assam and other parts of the N.E. region reported 70 species of Amphibians out of which Gangenophisfulleri and Ichthyphisgaroensis are endemic to Assam.

Fish Diversity: A total of 185 species of fishes are reported from Assam out of which 25 species areidentified as threatened.

Molluscan Diversity: So far 39 species of freshwater snails have been reported from Assam of which10 species are used as food.

Butterfly and Moths Diversity: Around 1,500 species of butterflies are reported from India of which nearly half are reported from Assam and north east India. The Swallowtail butterflies occupy an important place and the IUCN has identified the entire N.E. Region as Swallowtail rich zone. About387 species of moths are found in Assam.

Assam is famous for its megafauna including the rhino (*Rhinoceros unicornis*) golden langur (*Trachypithecusgeei*), hoolock gibbon (*Hoolock hoolock*) and other highly endangered species like the pygmy hog (Porculasalvania), hispid hare (*Caprolagushispidus*) and the recently rediscovered whitewinged wood duck (*Cairinascutulata*). The table below presents the change in population of few of themammals and primates of Assam.

Detailed list of flora and fauna is given in **Annexure 1** and **Annexure 2.**

4. Approach and Result

Approach

The study to be carried out in two (2) parts:

Baseline study was conducted to determine flora & fauna species available in the project area. They were identified through review of data from secondary sources like important data base (IBAT Business), IUCN Red data lists, other literatures/publications, various notifications/gazette, forest/wildlife management plans, Wildlife Protection Act 1972 & its amendments and other studies, if available.

Field Study and collection of primary data to be conducted along the route in protected/sensitive areas on key parameters like:

- Details of flora & fauna with special references to endemic/threatened species population report from the study area. Standard sampling method, as applicable has been used for this purpose.
- Description of habitat for such endemic/threatened species, ecology and like threat including the breeding, foraging pattern and its conservation plan/biodiversity action plan undertaken, if any.
- Socio-economic values of the affected area vis-à-vis biodiversity values.
- Consultations with forest/ wildlife officials, local communities, technical & managerial staff of utility and survey team.
- Compilation of season's Bio-diversity data as per requirement.
- Any other thing required to get wildlife clearance but not specifically covered above.

Methodology

A systematic vegetation survey to be conducted in the project zone to estimate the plant community structure. A fixed transect of 500 meters wide, positioned beneath the proposed transmission lines, to be used for the survey. The sampling unit size (quadrat) to be determined using the species-area curve method. For the tree layer, 10m x 10m random quadrats within the direct impact zone (46m) and the buffer zone (23m to 250m on both sides) and two randomly placed 3m x 2m shrub plots to be laid along with five 1m x 1m quadrats to gather information on the ground layer and other herbaceous species. Data collection and analysis to be done following standard procedures.

Format of the Report

Electricity lines are vital infrastructure for modern society but can have significant impacts on biodiversity. A comprehensive biodiversity assessment framework is essential to identify, mitigate, and manage these impacts. This framework will cover pre-construction, construction, and post-construction phases to ensure a holistic approach to biodiversity conservation. As such on basis of baseline study a draft table of contents for preparation of Biodiversity Conservation plan is given to supplement the secondary sources and Integrated Biodiversity Assessment Tool (IBAT) Analysis for all service station and associated transmission line proposed under AISTSEP Phase –II.

Description of Biological Environment:

1. **Background**
2. **Project Description**
    a. **Project team members**
    b. **Transmission line route selection**
    c. **Design Specifications and Area of Influence of the Transmission Line**
    d. **Key Construction Related Activities**
    e. **Legal Context of the Study**
    f. **Why Biodiversity Impact Assessment?**
    g. **Legal and Regulatory Aspects**
3. **Project Area**
    h. **General Profile of study area**
    i. **Biodiversity Profile of study area**
    j. **Existing Green Belt**
    k. **Lumding RF**

   i. **Flora**
   ii. **Fauna**
- l. **LantingMupa Reserve Forest**
   i. **Flora**
   ii. **Fauna**
- m. **Marat Longri Wildlife Sanctuary**
   i. **Flora**
   ii. **Fauna**
- n. **Agriculture**

4. **Approach and Result**
   - o. **Approach**
   - p. **Methodology**
   - q. **Sampling Strategy**
   - r. **Habitat survey**
5. **Result**
   - s. **Flora**
   - t. **Fauna**
   - u. **Aquatic Fauna**
   - v. **RET species**
6. **Impact Assessment and Mitigation Plans**

Annexures

1. List of flora,
2. Floristic characteristic (1 km along the alignment on either side)
3. List of fauna
4. List of plant species for green development
5. List of agriculture crops
6. List of existing tree plantation (if any)
7. Fish catch
8. List of plant species for green development
9. List of agriculture crops
10. List of existing tree plantation (if any)

Biodiversity and Wildlife Conservation & Management Plan:

As per the Standard ToR, based on the description of biological environment, Biodiversity and Wildlife Conservation & Management Plan for conservation and preservation of endemic, rare and endangered species of flora and fauna to be prepared in consultation with Assam's Forest Department. However, Biodiversity Conservation & Wildlife Management plan may typically include following:

1. Objectives
2. Management measures for Wildlife Habitat Preservation & Improvement, which may include Afforestation and Enrichment plantation, Bamboo Plantation, Farm forestry
3. Establishment of Germ-plasm Bank and Seed Centre
4. Contour Trenches
5. De-weeding and Sowing of Grass
6. Biodiversity monitoring
7. Awareness promotion
8. Strengthening of Infrastructural Facilities of Forest Department

9. Safeguard Measures
10. Biodiversity Management Committee (BMC)
11. Budget

Annexures 1: List of flora in the Study Area

Botanical name	Family	Habit	Habitat	Conservation status
Acacia pennata (Linnaeus)	***Fabeaceae***	Tree	Terrestrial	LC
Aegle marmelos (Linnaeus)	***Rutaceae***	Tree	Terrestrial	NE
Alpinia nigra (Gaertner) Burtt	***Zingiberaceae***	Herb	Aquatic	NE
Alternanthera philoxeroides (Martius)	***Amaranthaceae***	Herb	Aquatic	NE
Alternanthera sessilis (Linnaeus) R. Brown *ex* de Candolle	***Amaranthaceae***	Herb	Terrestrial	LC
Amblovenatum opulentum J.P. Roux	***Thelypteridaceae***	Herb	Marshy	NE
Amorphophallus sylvaticus(Roxburgh)	Araceae	Herb	Terrestrial	NE
Antidesma acidum Retzius	***Phyllanthaceae***	Tree	Terrestrial	NE
Artocarpus lacucha Buchanan-Hamilton	***Moraceae***	Tree	Terrestrial	NE
Azadirachta indica A. Jussieu	***Meliaceae***	Tree	Terrestrial	NE
Baccaurea ramiflora Loureiro	***Phyllanthaceae***	Tree	Terrestrial	NE
***Bambusa* sp.**	***Poaceae***	Herb	Terrestrial	NE
Bauhinia racemosa Lamarck	***Fabeaceae***	Tree	Terrestrial	NE
Bauhinia variegata Linnaeus	***Fabeaceae***	Tree	Terrestrial	LC
Blumea lanceolaria (Roxburgh) Druce	***Asteraceae***	Shrub	Terrestrial	NE
Callicarpa arborea Roxburgh	***Lamiaceae***	Tree	Terrestrial	NE
Calotropis gigantea (Linnaeus) Dryander	***Apocynaceae***	Shrub	Terrestrial	NE
Capsicum annuum Linnaeus	***Solonaceae***	Herb	Terrestrial	NE
Centella asiatica (Linnaeus) Urban	***Apiaceae***	Herb	Terrestrial	LC
Cheilocostus speciosus (J. Koenig)	***Costaceae***	Herb	Terrestrial	NE
Chionachne gigantea (J. Koenig)	***Poaceae***	Herb	Marshy	LC
Cinnamomum verum J. Presl	***Lauraceae***	Tree	Terrestrial	NE
Citrus maxima (Burman) Merrill	***Rutaceae***	Tree	Terrestrial	NE
***Citrus* sp.**	***Rutaceae***	Shrub	Terrestrial	NE
Clerodendrum glandulosum Lindley	***Lamiaceae***	Shrub	Terrestrial	NE
Coccinia grandis (Linnaeus) Voigt	***Cucurbitaceae***	Climber	Terrestrial	NE
Colocasia esculenta (Linnaeus)	***Areaceae***	Herb	Aquatic	LC
Combretum album Persoon	***Combretaceae***	Climber	Terrestrial	NE
Commelina benghalensis Linnaeus	***Commelinaceae***	Herb	Marshy	LC
Croton joufra Roxburgh	***Euphorbiaceae***	Tree	Terrestrial	NE
Cucumis melo Linnaeus	***Cucurbitaceae***	Climber	Terrestrial	NE
Cyanthillium cinereum (Linnaeus)	***Asteraceae***	Herb	Terrestrial	NE
Deeringia amaranthoides (Lamarck) Merrill	***Amaranthaceae***	Herb	Terrestrial	NE
Dendrocnide sinuata (Blume) Chew	***Urticaceae***	Shrub	Terrestrial	NE
Dillenia indica Linnaeus	***Dilliniacea***	Tree	Terrestrial	NE
Dillenia pentagyna Roxburgh	***Dilliniacea***	Tree	Terrestrial	NE
Dillenia scabrella (D. Don)	***Dilliniacea***	Tree	Terrestrial	NE
Dimocarpus longan Loureiro	***Sapindaceae***	Tree	Terrestrial	LR/NT
Dioscorea alata Linnaeus	***Dioscoreaceae***	Climber	Terrestrial	NE
Dioscorea esculenta (Loureiro) Burkill	***Dioscoreaceae***	Climber	Terrestrial	NE
Dioscorea glabra Roxburgh	***Dioscoreaceae***	Climber	Terrestrial	NE

Botanical name	Family	Habit	Habitat	Conservation status
Dioscorea pentaphylla Linnaeus	***Dioscoreaceae***	Climber	Terrestrial	NE
Diplazium esculentum (Retzius) Swartz	***Athyriaceae***	Herb	Marshy	LC
Enydra fluctuans Loureiro	***Astereaceae***	Herb	Aquatic	NE
Etlingera elatior (Jack) R.M. Smith	***Zingiberaceae***	Herb	Terrestrial	NE
Ficus hispida Linnaeus *f.*	***Moraceae***	Shrub	Terrestrial	NE
Garcinia lanceifolia Roxburgh	***Clusiaceae***	Tree	Terrestrial	NE
Garcinia pedunculata Roxburgh *ex*	***Clusiaceae***	Tree	Terrestrial	NE
Garcinia xanthochymus Hooker *f.* ex	***Clusiaceae***	Tree	Terrestrial	NE
Gnetum gnemon Linnaeus	***Gnetaceae***	Herb	Terrestrial	LC
Gymnopetalum chinense (Loureiro)	***Cucurbitaceae***	Climber	Terrestrial	NE
Hodgsonia macrocarpa (Blume) Cogniaux	***Cucurbitaceae***	Climber	Terrestrial	NE
Homalomena aromatica (Sprengel)	***Areaceae***	Herb	Terrestrial	NE
Houttuynia cordata Thunberg	***Saururaceae***	Shrub	Terrestrial	NE
Ipomoea aquatica Forsskål	***Convolvulaceae***	Herb	Aquatic	LC
Lasia spinosa (Linnaeus) Thwaites	***Areaceae***	Herb	Aquatic	LC
Mangifera sylvatica Roxburgh	***Anacardiaceae***	Tree	Terrestrial	LR/ LC
Maranta arundinacea Linnaeus	***Marantaceae***	Herb	Terrestrial	NE
Momordica charantia Linnaeus	***Cucurbitaceae***	Climber	Terrestrial	NE
Momordica cochinchinensis	***Cucurbitaceae***	Climber	Terrestrial	NE
Murraya koenigii (Linnaeus) Sprengel	***Rutaceae***	Shrub	Terrestrial	NE
Oenanthe javanica (Blume) de	***Apiaceae***	Herb	Aquatic	LC
Olax acuminata Wallich ex Bentham	***Olacaceae***	Shrub	Terrestrial	NE
Oroxylum indicum (Linnaeus) Kurz	***Bignoniaceae***	Tree	Terrestrial	NE
Oxalis corniculata Linnaeus	***Oxalidaceae***	Herb	Terrestrial	NE
Paederia foetida Linnaeus	***Rubiaceae***	Climber	Terrestrial	NE
Parabaena sagittata Miers	***Menispermaceae***	Climber	Terrestrial	NE
Parkia timoriana (de Candolle)	***Fabiaceae***	Tree	Terrestrial	NE
Phlogacanthus thyrsiflorus Nees	***Acanthaceae***	Shrub	Terrestrial	NE
Phyllanthus emblica Linnaeus	***Phyllanthaceae***	Tree	Terrestrial	NE
Phyllanthus sikkimensis Müller	***Phyllanthaceae***	Shrub	Terrestrial	NE
Physalis peruviana Linnaeus	**Solonaceae**	Herb	Terrestrial	NE
Piper thomsonii (C. de Candolle) Hooker *f.*	***Piperaceae***	Climber	Terrestrial	NE
Pogostemon parviflorus Bentham	***Lamiaceae***	Shrub	Terrestrial	NE
Rhaphidophora calophylla Schott	***Areaceae***	climb er	Epiphyte	NE
Rhynchotechum ellipticum (Wallich *ex* D. Dietrich) de Candolle	***Gesneriaceae***	Herb	Terrestrial	NE
Sapindus mukorossi Gaertner	***Sapindaceae***	Tree	Terrestrial	NE
Sauropus androgynus (Linnaeus) Merrill	***Phyllanthaceae***	Herb	Terrestrial	NE
Smilax glabra Roxburgh	***Smilacaceae***	Climber	Terrestrial	NE
Solanum americanum Miller	***Solonaceae***	Herb	Terrestrial	NE
Solanum torvum Swartz	***Solonaceae***	Shrub	Terrestrial	NE
Spilanthes acmella (Linnaeus) Linnaeus	***Asteraceae***	Herb	Marshy	NE
Spondias pinnata (Linnaeus *f.*) Kurz	***Anacardiaceae***	Tree	Terrestrial	NE
Tabernaemontana divaricata (Linnaeus) R. Brown ex Roemer & Schultes	***Apocynaceae***	Shrub	Terrestrial	NE
Tamarindus indica Linnaeus	***Fabiaceae***	Tree	Terrestrial	NE

Botanical name	Family	Habit	Habitat	Conservation status
Terminalia chebula Retzius	***Combretaceae***	Tree	Terrestrial	NE
Xanthium strumarium Linnaeus	***Asteraceae***	Tree	Terrestrial	NE
Zanthoxylum oxyphyllum	***Rutaceae***	Herb	Terrestrial	NE
Zingiber zerumbet (Linnaeus) Roscoe *ex* Smith	***Zingiberaceae***	Herb	Terrestrial	NE
Ziziphus jujuba Miller	***Rhamnaceae***	Tree	Terrestrial	LC

Annexure 2: List of fauna in the Study Area

List of Avifauna present in Lumding Reserve Forest

Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
1.	Passeriformes	Pycnonotidae	Red vented bulbul	*Pycnonotus cafer*	Nectivorous, Frugivorous,Insectivorous, Palynivorous	Least Concern
2.		Campephagidae	Scarlet minivet	*PericrocotusCarnivorous*	Insectivorous, Concern ophiophagous	Least Concern
3.		Oriolidae	Black headed oriole	*Oriolus larvatus*	Frugivorous, Insectivorous	Least Concern
4.			Indian Golden oriole	*Oriolus kundoo*	Nectivorous, Frugivorous,Insectivorous,	Least Concern
5.		Pittidae	Black crown pitta	*Erythropitta ussheri*	Carnivorous, Insectivorous	Least Concern
6.			Indian pitta	*Pitta brachyura*	Carnivorous, Insectivorous	Least Concern
7.		Orididae	maroon oriole	*Oriolus traillii*	Insectivorous, Nectivorous	Least Concern
8.		Alaudidae	eastern skylark (oriental skylark)	*Alauda gulgula*	Granivorous	Least Concern
9.		Dicruridae	Racket tailed drongo	*Dicrorus paradiseus*	Insectivorous, Nectivorous	Least Concern
10.			Black drongo	*Dicrorus macrocercus*	Insectivorous	Least Concern
11.			Ashy drongo	*Dicrorus leucophaeus*	Insectivorous	Least Concern
12.			Bronzed drongo	*Dicrurus aeneus*	Insectivorous	Least Concern
13.		Nectariniidae	Nepal sunbird	*Aethopyga nipalensis*	Nectivorous	Least Concern
14.		Sturnidae	Hill myna	*Gracula religiosa*	Omnivorous, Insectivorous, Frugivorous	Least Concern
15.		Laniidae	White crowned shrike	*Eurocephalus anguitimens*	Insectivorous, Carnivorous	Least Concern
16.			Bull headed shrike	*Lanius bucephalus*	Insectivorous, Carnivorous	Least Concern
17.			Long tailed	*Larius collaris* fiscal shrike	Insectivorous, Carnivorous	Least Concern

Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
18.		Leiothrichidae	Jungle babbler	*Argya striata*	Insectivorous	Least Concern
19.		Pycnonotidae	Black headed bulbul	*Pycnonotus atriceps*	Insectivorous, Frugivorous	Least Concern
20.		Hirundinidae	Red rumped swallow	*Cecropis daurica*	Insectivorous	Least Concern
21.		Passeri	Fairy blue bird	*Irena puella*	Insectivorous, Nectivorous	Least Concern
22.		Chloropseidae	Gold fronted leafbird	*Chroropsis aurifrons*	Omnivorous	Least Concern
23.			Orange bellied	*Chloropsis*	Insectivorous	Least Concern
24.			Leafbird	*hard wickii*	Nectivorous	
25.		Pycnonotidae	Brown eared bulbul	*Hypsipetes amaurotis*	Insectivorous, Frugivorous, Nectivorous	Least Concern
26.		Mectarinidae	Large browed wagtail	*Motacilla moderaspatensis*	Insectivorous	Least Concern
27.		Estrildidae	Spotted munia	*Lonchura punctulata*	Granivorous	Least Concern
28.			Black headed munia	*Lonchura malacca*	Granivorous	Least Concern
29.		Ploceidae	Baya weaver bird	*Ploceus philippinus*	Granivorous, Insectivorous	Least Concern
30.		Dicruridae	Lesser racket tailed drongo	*Dicrurus remifer*	Insectivorous	Least Concern
31.		Muscicapidae	White rumped	*Copsychus* magpie	Insectivorous, *malabaricus* Carnivorous	Least Concern
32.		Sturnidae	Common myna	*Acridotheres tristis*	Insectivorous, Granivorous, Carnivorous, Omnivorous	Least Concern
33.			White headed starling	*Sturnia erythropygia*	Insectivorous	Least Concern
34.			Brahminy starling	*Sturnus pagodarum*	Omnivorous	Least Concern
35.			Jungle myna	*Acridotheres fuscus*	Omnivorous	Least Concern
36.			Indian Pied myna	*Gracupica contra*	Omnivorous	Least Concern
37.		Motacilladae	Yellow wagtail	*Motacilla flava*	Insectivorous	Least Concern
38.			Citrine wagtail	*Motacilla citriola*	Insectivorous	Least Concern
39.		Turdidae	Common black bird	*Turdus merula*	Omnivorous	Least Concern
40.		Vangidae	Indian	*Tephrodornis*	Insectivorous	Least

Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
			wood shrike	*pondicerianus*		Concern
41.		Motacilladae	Indian paddy field pipit	*Anthus rufulus*	Insectivorous	Least Concern
42.		Paridae	Great tit	*Parus major*	Insectivorous	Least Concern
43.		Alaudidae	Black lark	*Melanocorypha yeltoniensis*	Insectivorous	Least Concern
44.		Corvidae	Sand lark	*Alaudala raytal*	Insectivorous	Least Concern
45.			Jungle crow	*Corvus culminates*	Frugivorous	Least Concern
46.			House crow	Corvus splendens	*Omnivorous*	Least Concern
47.		Monarchidae	Paradise flycatcher	*Terepsiphone paradisi*	Insectivorous	Least Concern
48.		Muscicapidae	Blue flycatcher	*Cyornis tickelliae*	Carnivorous	Least Concern
49.		Chloropseidae	Leaf bird	*Chloropsis flavipennis*	Insectivorous, Frugivorous, Nectivorous	Vulnerable
50.		Laniidae	Brown shrike	*Lanius cristatus*	Insectivorous	Least Concern
51.		Muscicapidae	Shama bird	*Copsychus malabaricus*	Insectivorous, Frugivorous	Least Concern
52.			Slaty backed forktail bird	*Enicurus schistaceus*	Carnivorous	Least Concern
53.			Plumbeous redstart	*Rhyacornis fuliginosa*	Insectivorous, Carnivorous	Least Concern
54.		Leiothrichidae	Grey sibia	*Heterophasia gracilis*	Insectivorous, Frugivorous	Least Concern
55.			Jungle babbler	*Turdoides striata*	Insectivorous, Granivorous, Nectivorous	Least Concern
56.			Common babbler	*Argya caudate*	Mnivorous	Least Concern
57.			White crowned shrike	*Eurocephalu ruppelli*	Carnivorous	Least Concern
58.		Psittaculidae	Alexandrine parakeet	*Psittacula eupatria*	Omnivorous	Near Threatened
59.		Laniidae	Red breasted parakeet	*Psittacula alexandri*	Frugivorous, Granivorous	Near Threatened
60.		Pnoepygidae	Pygmy cupwing	*Pnoepyga pusilla*	Insectivorous	Least Concern
61.		Pellorneidae	Brown capped babbler	*Pellomeum fuscocapillus*	Insectivorous	Least Concern
62.			Marsh spotted babbler	*Pellomeum palustre*	Insectivorous	Vulnerable
63.		Paradoxornithidae	Grey headed	*Psittiparus gularis* parrot bill	Insectivorous	Least Concern
64.		Corvidae	Red	*Pycnonotus jocosus*	Insectivorous,	Least

Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
			whiskered bulbul		Frugivorous	Concern
65.			Black browed treepie	*Dendrocitta frontalis*	Carnivorous	Least Concern
66.		Passeridae	House sparrow	*Passer domesticus*	Insectivorous	Least Concern
67.			Tree sparrow	*Passer montanus*	Insectivorous	Least Concern
68.		Paridae	Oriental tit	*Parus minor*	Omnivorous, Molluscivorous	Least Concern
69.		Anatidae	Pin tail duck	*Anas acuta*	Granivorous	Least Concern
70.	Piciformes	Megalaimidae	Large green barbet	*Psilopogon zeylanicus*	Frugivorous, Insectivorous	Least Concern
71.			Coppersmith barbet	*Psilopogon haemacephalus*	Frugivorous	Least Concern
72.		Picidae	Golden backed woodpecker	*Dinopium benghalense*	Insectivorous	Least Concern
73.			Large golden backed woodpecker	*Chrysocolaptes guttacristatus*	Frugivorous, Insectivorous, Granivorous	Least Concern
74.			Rufous piculet	*Sasia abnormis*	Insectivorous, Carnivorous	Least Concern
75.			Darjeeling pied woodpecker	*Dendrocopos darjellensis*	Insectivorous	Least Concern
76.			Heart spotted woodpecker	*Hemicircus canente*	Insectivorous	Least Concern
77.			Large yellow fronted woodpecker	*Melanerpes flavifrons*	Insectivorous, Frugivorous	Least Concern
78.			Rufous woodpecker	*Micropternus brachyurus*	Insectivorous,Frugivorous, Nectivorous	Least Concern
79.	Bucerotiformes	Bucerotidae	Grey hornbill	*Ocyceros birostris*	Granivorous	Least Concern
80.		Upupidae	Hoopoe	*Upupa* sp	Insectivorous, Carnivorous	Least Concern
81.	Gruiformes	Rallidae	Coot	*Fulica atra*	Omnivorous	Least Concern
82.		Rallidae	Common moorhen	*Gallinula chloropus*	Omnivorous	Least Concern
83.			Western swamphen	*Porphyrio porphyrio*	Omnivorous	Least Concern
84.		Ardeidae	Little egret	*Egretta garzetta*	Carnivorous	Least Concern
85.	Apodiformes	Trochilidae	Ruby	*Archilochus colubris*	Insectivorous	Least

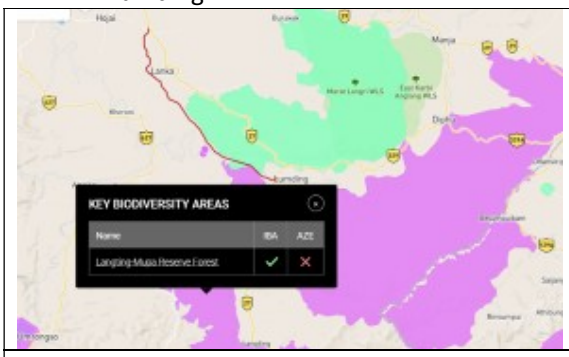
Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
			throated humming bird			Concern
86.	Accipitriformes	Accipitridae	Indian white rumped vulture	*Gyps bengalensis*	Carnivorous	Critically Endangered
87.			Shikra (Indian shikra)	*Accipiter badius*	Insectivorous	Least Concern
88.			Pariah kite	*Milvus migrans*	Carnivorous, Avivorous	Least Concern
89.			Pied harrier	*Circus melanoleucos*	Insectivorous, Avivorous	Least Concern
90.			Crested serpent eagle	*Spilornis cheela*	Insectivorous, Ophiophagous	Least Concern
91.			Black winged kite	*Elanus caeruleus*	Insectivorous	Least Concern
92.			Black eared baza	*Aviceda leuphotes*	Insectivorous	Least Concern
93.			Changeable hawk eagle	*Nisaetus cirrhatus*	Avivorous	Least Concern
94.			Crested serpent eagle	*Spilornis cheela*	Carnivorous, Avivorous, Carnivorous	Least Concern
95.			White tailed eagle	*Haliaeetus albicilla*	Carnivorous	Least Concern
96.	Columbiformes	Columbidae	Spotted dove	*Stiloopelia chinensis*	Frugivorous, Granivorous	Least Concern
97.			Ring necked dove	*Streptopelia capicola*	Insectivorous, Frugivorous, Granivorous, Insectivorous	Least Concern
98.			Emerald dove	*Chalcophaps indica*	Frugivorous	Least Concern
99.			Red turtle dove	*Streptopelia tranque baricha*	Granivorous	Least Concern
100.			Green imperial pigeon	*Ducula aenea*	Granivorous	Near Threatened
101.			Rock pigeon	*Columba livia*	Granivorous, Frugivorous, Insectivorous	Least Concern
102.			Imperial pigeon	*Dacula* sp	Frugivorous	Least Concern
103.			Spotted dove	*Spoilopelia chinenois*	Insectivorous	Least Concern
104.	Coraciiformes	Meropidae	Chestnut headed bee eater	*Merops leschenaultia*	Insectivorous	Least Concern
105.			Green bee eater	*Merops orientalis*	Insectivorous, Carnivorous	Least Concern
106.		Alcedinidae	White breasted kingfisher	*Halcyon smyrnensis*	Insectivorous, Carnivorous	Least Concern
107.			Common	*Alcedo anthis*	Carnivorous,	Least

Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
			kingfisher	*bengalensis*	Insectivorous, Piscivorous	Concern
108.	Trogoniformes	Trogonidae	Red headed trogon	*Harpactes erythrocephalus*	Insectivorous	Least Concern
109.	Cuculiformes	Cuculidae	Crow pheasant	*Centropus sinensis*	Carnivorous	Least Concern
110.	Galliformes	Phasianidae	Asian koel	*Eudynamys scolopaceus*	Omnivorous	Least Concern
111.			Black francolin	*Francolinus francolinus*	Insectivorous	Least Concern
112.			Grey partridge	*Perdix perdix*	Insectivorous, Granivorous	Least Concern
113.			Jungle bush quail	*Perdicula asiatica*	Frugivorous,	Least Concern
114.			Red jungle fowl	*Gallus gallus*	Granivorous, Frugivorous	Least Concern
115.			Kalij pheasant	*Lophura leucomelanos*	Omnivorous	Least Concern
116.		Dicacidae	Plain coloured flower pecker	*Diacacum minullum*	Frugivorous, Nectivorous	Least Concern
117.		Pycnorotidae	Black bulbul	*Hypsipetes leucocephalus*	Insectivorous, Granivorous	Least Concern
118.	Ciconiiformes	Ciconiidae	Greater adjutant	*Leptoptilos dubius*	Omnivorous, Carnivorous	
119.			Lesser adjutant	*Leptoptilos javanicus*	Omnivorous, Carnivorous, Piscivorous	Vulnerable
120.			Black necked stork	*Ephippiorhynctus asiaticus*	Carnivorous	Near Threatened
121.			Scaly breasted stork	*Anastomus oscitans*	Carnivorous, Molluscivorous	Least Concern
122.	Suliformes	Phalacrocoracidae	Little cormorant	*Microcarbo niger*	Carnivorous	Least Concern
123.			Large cormorant	*Phalacrocorax carbo*	Carnivorous	Least Concern
124.			Indian cormorant	*Phalacrocorax fusicollis*	Carnivorous	Least Concern
125.		Anhingidae	Darter	*Anhinga* sp	Piscivorous	Near threatened
126.	Pelecaniformes	Ardeidae	Great egret	*Ardea alba*	Carnivorous	Least Concern
127.			Medium egret	*Ardea intermedia*	Carnivorous	Least Concern
128.			Cattle erget	*Bubulcus ibis*	Carnivorous	Least Concern
129.			Yellow bittern	*Ixobrychus sinensis*	Carnivorous	Least Concern
130.			Chinese pond heron	*Ardeola bacchus*	Carnivorous	Least Concern
131.			Indian pond	*Ardeola grayii*	Carnivorous	Least Concern

Sr. No.	ORDER	FAMILY	COMMON NAME	SCIENTIFIC NAME	Feeding habits*	IUCN Red List (2019-22) status**
			heron			
132.			Night heron	*Nycticorax nyctanassa*	Insectivorous, Avivorous	Least Concern
133.			Bittern	*Botaurus stephens*	Carnivorous	Least Concern
134.			Tiger heron	*Tigrisoma lineatum*	Carnivorous	Least Concern
135.	Strigiformes	Strigidae	Jungle owlet	*Glaucidium radiatum*	Insectivorous	Least Concern
136.			Brown fish owl	*Ketupa zeylonensis*	Piscivorous	Least Concern
137.		Tytonidae	Barn owl	*Tyto alba*	Carnivorous	Least Concern
138.	Anseriformes	Anatidae	Common pochard	*Aythya ferina*	Molluscivorous, Insectivorous	Vulnerable
139.			Lesser whistling duck	*Dendrocygna javanica*	Gregarious	Least Concern
140.			Brahminy duck	*Tadorma ferruginea*	Omnivorous	Least Concern
141.	Charadriiformes	jacanidae	Pheasant tailed jacana	*Hydrophasianus chirurgus*	Insectivorous, Molluscivorous	Least Concern
142.			Bronze winged jacana	*Metopidius indicus*	Insectivorous	Least Concern
143.		Charadriidae	Red wattled lapwing	*Vanellus indicus*	Insectivorous, Granivorous, Molluscivorous	Least Concern
144.		Laridae	Spur winged lapwing	*Vanellus spinosus*	Insectivorous	Least Concern
145.			River tern	*Sterna aurantia*	Insectivorous, Piscivorous	Vulnerable
146.			Indian robin	*Saxicoloides fulicatus*	Insectivorous	Least Concern
147.		Scolopacidae	Long toed stint	*Calidris subminuta*	Insectivorous, Molluscivorous, Granivorous	Least Concern

Integrated Biodiversity Assessment Tool (IBAT) Analysis for all S/s and associated T/Ls proposed under AISTSEP Phase-II

1. **Proposed S/S Name**: New 132/33 kV (2X50 MVA) GIS Substation at Lumding
   Associated T/L: 132 KV Sankardevnagar (Existing) S/C Line - Lumding (New) S/C Line at Lumding

<table>
<tr><td> 
</td><td> 
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<tr><td colspan="2">The proposed T/L passes through 2 nos. of KBA Sites, namely LangtingMupa RF and Lumding Marat Logri RF</td></tr>
<tr><td> 
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</td></tr>
<tr><td colspan="2">IUCN Listed Sites not identified within RoW of the proposed T/L and substation location</td></tr>
</table>

2. **Proposed S/S Name**: New 220/132 kV (2X160 MVA) GIS Substation at Rowta
   Associated T/L: 220kV Rowta (New) - New Rangia (Tamulpur) D/C Line

<table>
<tr><td> 
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<tr><td>Key Biodiversity Areas not identified within RoW of the proposed T/L and substation location</td><td>IUCN Listed Sites not identified within RoW of the proposed T/L and substation location</td></tr>
</table>

Protected Areas and Designated Areas not found within RoW of the proposed T/L and substation location

3. **Proposed S/S Name**: New 132/33 kV (2X 50 MVA) AIS Substation at Serfanguri
   Associated T/L: 132kV Serfanguri (New) - Gossaigaon (Existing) D/C Line at Serfanguri

Key Biodiversity Areas not identified within RoW of the proposed T/L and substation location

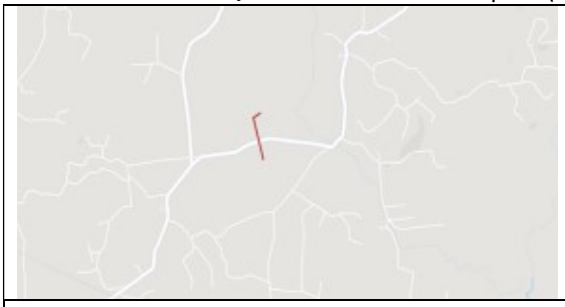
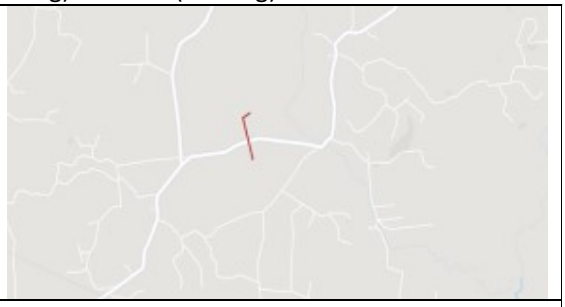
IUCN Listed Sites not identified within RoW of the proposed T/L and substation location

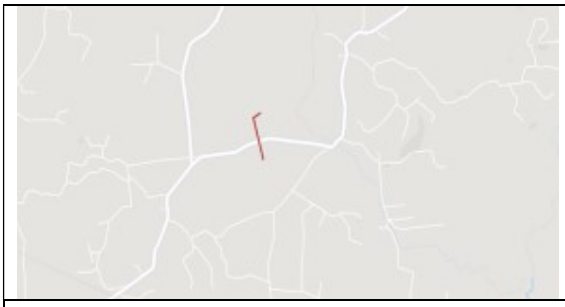
Protected Areas and Designated Areas not found within RoW of the proposed T/L and substation location

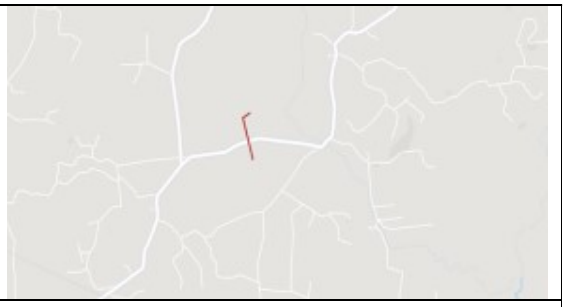
4. **Proposed S/S Name**: New 132/33 kV (2X50 MVA) AIS Substation at Dhing
   Associated T/L: 132kV Dhing (New) - Khaloigaon (Existing) D/C Line

	
Key Biodiversity Areas not identified within RoW of the proposed T/L and substation location	**IUCN Listed Sites not identified within RoW of the proposed T/L and substation location**
	
Protected Areas and Designated Areas not found within RoW of the proposed T/L and substation location	

5. **Proposed S/S Name**: New 132/33 kV (2X50 MVA) AIS Substation at Udarbond (Silchar-2)
   Associated T/L: LILO of 132KV Pailapool (Existing) -Srikona (Existing) Line at Udarbond

	
Key Biodiversity Areas not identified within RoW of the proposed T/L and substation location	**IUCN Listed Sites not identified within RoW of the proposed T/L and substation location**





Protected Areas and Designated Areas not found within RoW of the proposed T/L and substation location

6. **Proposed S/S Name**: New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor
   Associated T/L: 132kV Titabor (New) - Mariani (Existing) D/C Line

Key Biodiversity Areas not identified within RoW of the proposed T/L and substation location

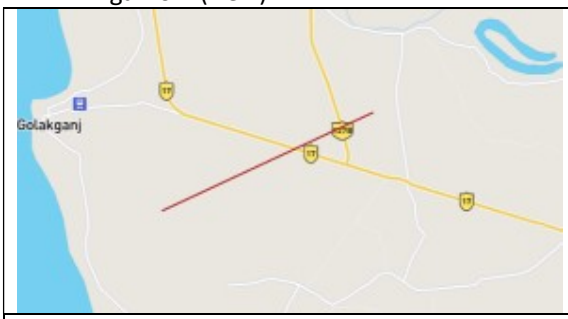
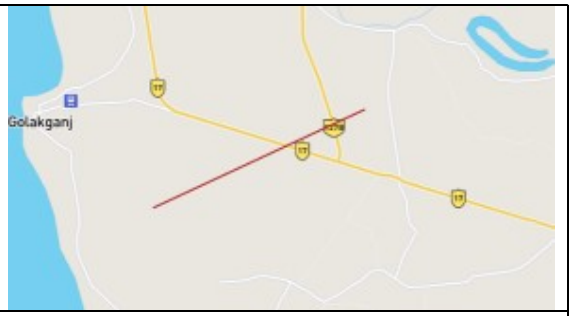
IUCN Listed Sites not identified within RoW of the proposed T/L and substation location

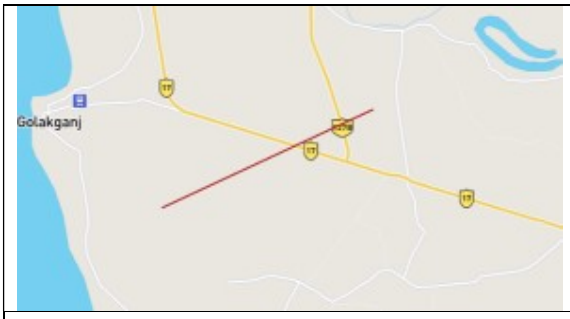
Protected Areas and Designated Areas not found within RoW of the proposed T/L and substation location

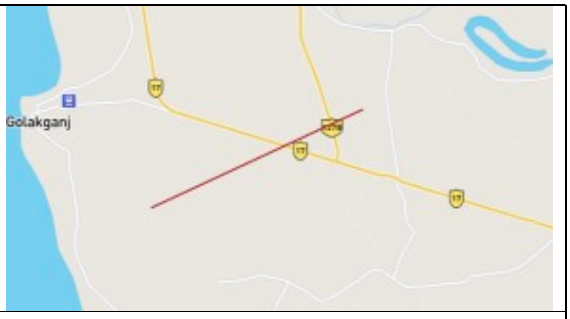
7. **Proposed S/S Name**: Establishment of new 132/33 kV (2 X 50 MVA) AIS Substation at Chabua
   Associated T/L: LILO of 132 KV Tinsukia (Existing) -Dibrugarh (Existing) S/C Line

	
Key Biodiversity Areas not identified within RoW of the proposed T/L and substation location	**IUCN Listed Sites not identified within RoW of the proposed T/L and substation location**
	
Protected Areas and Designated Areas not found within RoW of the proposed T/L and substation location	

8. **Proposed S/S Name**: New 132/33 kV (2 X 50 MVA) AIS Substation at Agamoni
   Associated T/L (BEE Line): 132 kV LILO of Gossaigaon - Gauripur S/C (Existing) Line at Agamoni (New)

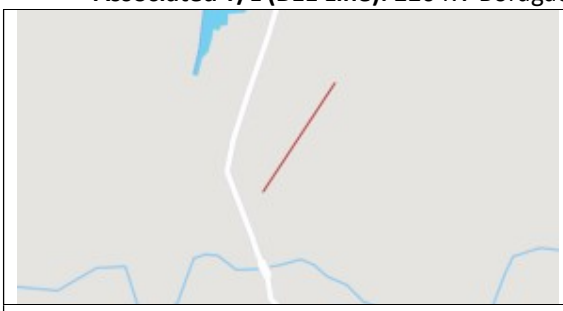
	
Key Biodiversity Areas not identified within RoW of BEE Line and substation location	**IUCN Listed Sites not identified within RoW of BEE Line and substation location**





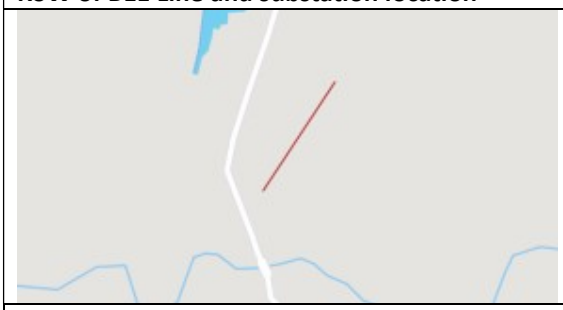
Protected Areas and Designated Areas not found within RoW of BEE Line and substation location

9. **Proposed S/S Name**: New 220/33 kV (2X100 MVA) GIS Substation at Boragaon (Jalukbari)
   Associated T/L (BEE Line): 220 KV Boragaon (Jalukbari)(New) - Kukurmara (Existing) D/C Line



Key Biodiversity Areas not identified within RoW of BEE Line and substation location

IUCN Listed Sites not identified within RoW of BEE Line and substation location



Protected Areas and Designated Areas not found within RoW of BEE Line and substation location

10. **Proposed S/S Name**: New 220/33 kV (2X100 MVA) GIS Substation at Panjabari
Associated T/L (BEE Line): LILO of 220kV Sonapur-Sarusajai (Existing) -S/C Line at Panjabari

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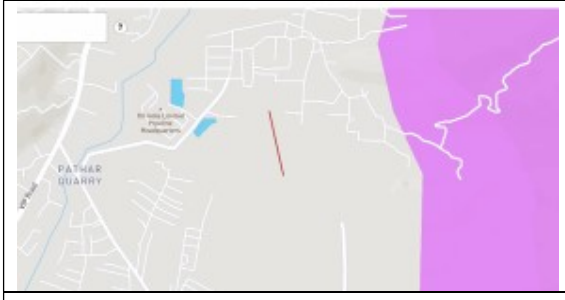
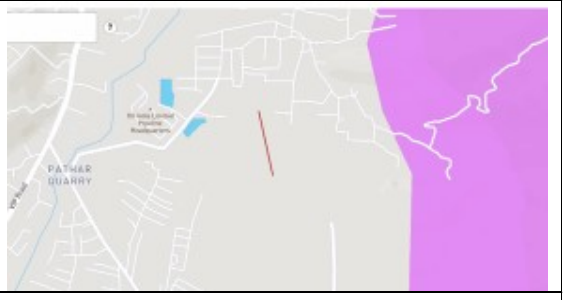
<tr><td>  </td><td>  </td></tr>
<tr><td>Key Biodiversity Areas not identified within RoW of BEE Line and substation location</td><td>IUCN Listed Sites not identified within RoW of BEE Line and substation location</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Protected Areas and Designated Areas not found within RoW of BEE Line and substation location</td></tr>
</table>

11. **Proposed S/S Name**: New 132/33 kV (2X50 MVA) GIS Substation at Zoo Road
Associated T/L (BEE Line): LILO of 132kV Kahilipara (existing) – Narengi (existing) S/C line at Zoo Road

<table>
<tr><td> 
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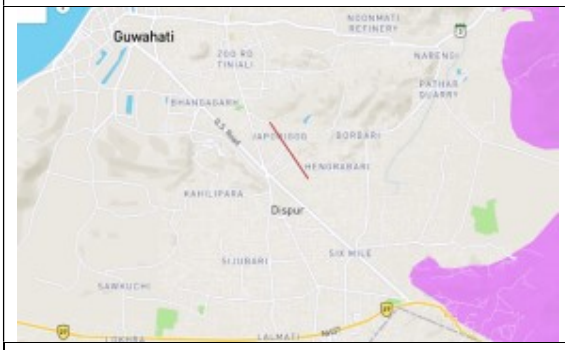
<tr><td>Key Biodiversity Areas not identified within RoW of BEE Line and substation location</td><td>IUCN Listed Sites not identified within RoW of BEE Line and substation location</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td colspan="2">Protected Areas and Designated Areas not found within RoW of BEE Line and substation location</td></tr>
</table>

12. **Proposed S/S Name**: New 132/33 kV (2 X50 MVA) AIS Substation at Morigaon
Associated T/L (BEE Line): 132kV Morigaon (New) – Baghjap (Existing) D/c line

	
Key Biodiversity Areas not identified within RoW of BEE Line and substation location	**IUCN Listed Sites not identified within RoW of BEE Line and substation location**
	
Protected Areas and Designated Areas not found within RoW of BEE Line and substation location	

13. **Proposed S/S Name**: New 132/33 kV (2 X 50 MVA) AIS Substation at Amayapur
Associated T/L (BEE Line): 132kV Amayapur (New) - Hajo (Existing) D/C Line

	
Key Biodiversity Areas not identified within RoW of BEE Line and substation location	**IUCN Listed Sites not identified within RoW of BEE Line and substation location**
	
Protected Areas and Designated Areas not found within RoW of BEE Line and substation location	

14. **Proposed S/S Name**: New 132/33 kV (2X50 MVA) AIS Substation at Dhupdhara
Associated T/L (BEE Line): 132kV Dhupdhara (New) - Boko (Existing) D/C Line

	
Key Biodiversity Areas not identified within RoW of BEE Line and substation location	**IUCN Listed Sites not identified within RoW of BEE Line and substation location**
	
Protected Areas and Designated Areas not found within RoW of BEE Line and substation location	

Appendix 8: Case Study of Tower Failure and its Remedies

Cause study of Tower failure and it's remedies

1. **CYCLONE**

   a) **TOWER EFFECTED BY HEAVY RAIN**

400KV D/C (QUAD) Nellore -Tiruvalem Transmission line failed on 04.12.2015 (One tower loc no.13)

Photo Plate 1:- Due to heavy cyclonic rain the tower location had breached and caused soil erosion at the base of tower. The erosion of soil below the foundations had resulted in tilting of frustums of the tower and cracking of the chimney.

Brief Background

400 kV D/C Nellore Thiruvalem transmission line was constructed by M/S KEC. The tower parts for the line were also supplied by M/S KEC. The line was commissioned on 15.04.2014. The length of line is 172.9 km. The towers of this portion were designed for wind zone 5 (50m/s) as per IS 802-1995. This is the first case of tower vulnerability noticed in the line.

Observations

On 04.12.2015, villagers informed that soil erosion have taken place in the foundation of location no. 13 of the transmission line. During inspection on 05.12.2015, it was observed that the Kalleru canal flowing 15-20 m away from the tower location had breached and the flood water inundated the foundations of the tower location. Soil up to the frustum bottom level was washed away in respect of legs A, C and D. Frustums of legs C and D were slightly tilted and cracks developed in chimney. Due to displacement of foundation, mainly of legs C& D, the tower belt member in the BC and CD section of tower got damaged and slightly bent. The legs B and C were found to be slightly deformed.

Probable Cause of Failure

There was heavy cyclonic rain in Nellore District between 09.11.2016 and 20.11.2016 and further continuous less intensity rain till 02.12.2016. The Kalleru canal, flowing 15-20 m away from the tower location had breached and caused soil erosion at the base of tower. The erosion of soil below the foundations had resulted in tilting of frustums of the tower and cracking of the chimney.

Restoration

Back filling of the tower legs has been done with the sand bags. The tower after repairs was re-energized on 26.04.2016. Committee recommended for early completion of strengthening of damaged tower foundations by providing proper protection to tower foundation. Use of pile foundation would be considered, if the failure is repeated.

CYCLONE

b) (TOWER EFFECTED BY LARGE WIND)

765 kV S/C Bina-Gwalior-III Transmission Line failed on 21.05.2016 (Location No 614)

Brief Background.

The line was commissioned on 07.05.2014. The towers of this line were designed for basic wind speed of 47 m/sec corresponding to Wind Zone-4 as per IS 802-1995. The towers were designed in Delta configuration with Quad ACSR BERSIMIS Conductor.765 kV S/C BinaGwalior-III transmission line tripped at 20:33 Hrs on 21.05.2016 due to collapse of one tower at location No. 614(A+0)

Observations

The tower is situated in cultivated field with very few trees in the vicinity. Tower collapsed and bent above third panel level. Adjacent towers were checked thoroughly for missing tower members and Bolts & Nuts. None of the tower members and Bolts & Nuts were found missing. Discussion with the local people in the nearby villages revealed that exceptionally high wind condition prevailed for some time in the area and tower had collapsed under high wind conditions. In absence of metrological data, it is difficult to assess the speed of wind on the day of failure of tower.

Probable Cause of Failure

The failure of towers might have been caused by localized cyclone in the area resulting in large wind load on phase conductors and earth wires as well as on tower body exceeding the design values.

Restoration

Restoration of the line on normal towers was done on 30.05.2016.

The committee noted that the pattern of failure is similar to that of failure of towers of 765 kV Gaya-Fatehpur S/C Line (Designed for Wind Zone-4) discussed in the previous standing committee meeting held on 08.12.2015 and suggested that the strengthening of towers has to be carried out in line with above mentioned line. Committee requested Powergrid to submit material test report.

WIND STORM

400 kV D/C Bamnauli-Jhatikara transmission line failed on 22.05.2016. Location no. 169 (Dead End Tower).

Brief Background

The line was originally commissioned as 400kV D/C Bawana-Bamnauli transmission line in 2000 and LILO of this line at 400kV TikriKalan (Formerly Mundka) substation was completed in 2010. Again LILO of the same line at 765kV PGCIL Jhatikara S/Stn. was commissioned on 30.09.2012 as Bamnauli-Jhatikara transmission line. The length of line is 10.2km. M/s. KEC Ltd. had executed the line construction. The part of the overhead line was converted into underground cable to create space for Gas based power plant to be constructed by IPGCL/PPCL. The modification was carried out in December 2013 by M/s BHEL for M/s. PPCL/IPGCL (Indra Prastha Generation Corporation Limited). The suspension tower at location No. 169 was converted into Dead end tower (D+0). The tower was designed for Quad bundled conductor as per IS: 802:1995 for wind zone-4 to withstand wind speed of 169.2 kms/hr. No previous failure of the line was reported. The tower schedule submitted by DTL shows that the line with towers at location no. 2 to 19 was commissioned in 2012 and Towers at location No.155 to 168 commissioned in 2000. Due to heavy wind storm on 22.05.2016, the Dead end tower at Location No.169 along with Gantry structure have failed and the two structures crumbled down on the ground.

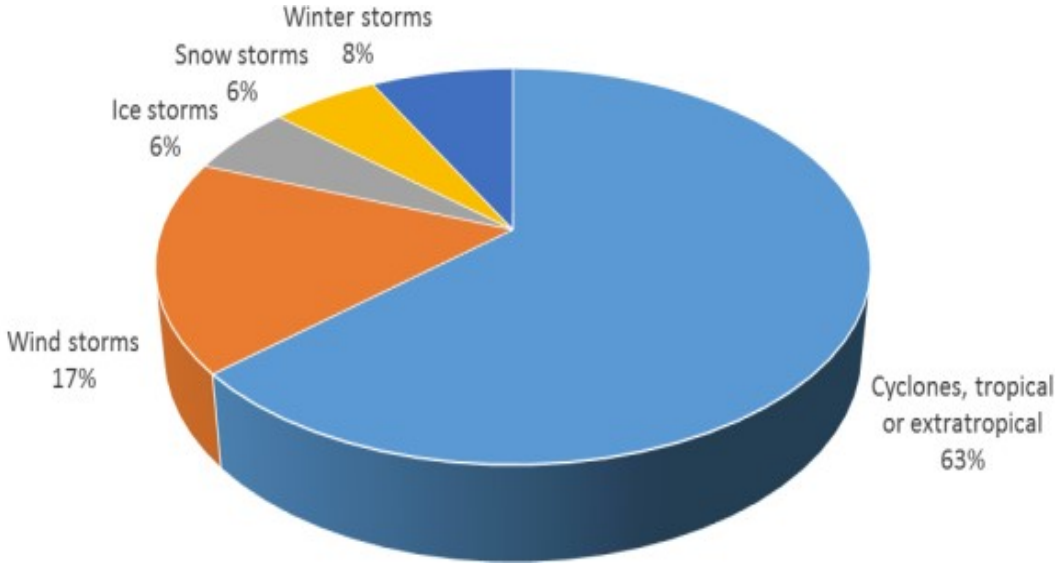
Observations

The team comprising of officers from CEA, Powergrid and DTL had visited the site of tower failure on 25.05.2016.It was observed that the tower had buckled from first panel and had fallen in longitudinal direction simultaneously damaging the gantry structure due to the upward pulling force. All the foundations were found intact. The stubs of three legs were intact while the fourth one got twisted and sheared. A number of bolts in joints used for connecting leg members, other members, etc. were found to be missing. At some of the joints in leg/bracings, almost half of the bolts/nuts were missing. Further, some of the bolts used were undersized. Many of the members were having extra holes which were not plugged/filled with bolts. There was mismatch of bolts & holes. Some of the bolts were rusted. MS Earthing strip was welded with the stub instead of providing with bolts & nuts. The adjacent tower at location No.168 of the line was found to be intact and no visible damage observed. The foundations were intact and no missing members/bolts were noticed. The chimneys of foundations were not visible and buried in soil. The team also visited location No.173 (Dead End Tower) of the 2nd 400kV D/C Bamnauli-Ballabhgarh Transmission line. The tower at location No. 169 of BamnauliJhatikara line & location no. 173 of Bamnauli - Ballabhgarh line were constructed during same period. The tower/line was designed for Quad bundled conductor configuration. A part of this line was also converted into underground cable transmission system. It was noticed that some of the lattice members of existing tower at location No.173 were bent/buckled. The slope of the tower upto

bottom cross arm level was not uniform. Few bracing members of tower were welded with leg members/stubs. Many bolts in the joints are missing /mismatching. Some of the bolts used were undersized. The length of threads of bolt used in the joints was not adequate. Extra holes were left in many members which were not plugged/filled. The condition of this DE tower is similar to the failed DE tower at location No.169 of Bamnauli-Jhatikara line and may fail at any time.

Photo Plate- Tower Collapse due to wind storm

The back to back distance of the leg members at the top of stub of failed tower at location No.169 was measured at site and the measured length of transverse face and longitudinal face were found to be different from the drawings. Coping of the foundation Chimneys was not done. The Chemical & Mechanical properties of steel used in structure are found to be in conformity with IS 2062:2006



Probable Cause of Failure

The structurally weak tower due to missing bolts, visible erection deficiencies highlighted above and additional wind force on tower due to storm might have resulted in collapse of tower.

Restoration

The line was restored on ERS on 08.06.2016.

Observed

That major causes of failure of towers are as under: a) The high wind velocity during storm, cyclone and local phenomenon of whirlwind and gale etc. might have exceeded the wind speed for which the tower is designed. This type of wind is difficult to predict. The probability of such occurrences is low & the tower design will be uneconomical if such situation is considered in the design.

400 kV D/C Jind-Bhiwani Transmission Line Failed on 23.05.2016 & on 29.05.2016 [(Location No. 170) & (Location no. 12,13,14 &15)] Brief Background 400 kV D/C Jind-Bhiwani transmission line was designed by Powergrid and constructed by M/S Aravali Infrastructure Limited, New Delhi. The length of the line is 82.23 km.

The line CENTRAL ELECTRICITY AUTHORITY Report on failure of Transmission line towers during the period December 2015 to September 2016 26 was commissioned on 31.03.2013. The suspension towers of this line were designed for basic wind speed of 47 m/sec corresponding to Wind Zone-4 as per IS 802-1995 with I-I-I insulator string in vertical configuration for Twin ACSR Moose conductor. The line tripped at 20:37 Hrs. on 23.05.2016 due to collapse of one tower at location No. 170(DA). While the restoration work of tower at location no. 170 (DA) was in progress, two (2) more towers at

location No. 13(DA) and 14(DA) which had collapsed during localized storm on 29.05.2016. Earthwire peak of towers at location No. 12(DA) and 15(DA) was also damaged due to failure of towers at location no. 13(DA) & 14 (DA). Observations This is the third incidence of tower failure in this line. Earlier 4 towers had failed on 11.03.2014 and 5 towers on 29.06.2014 due to localized cyclone/high velocity winds. The tower No. 170 was partially damaged above bottom cross arm level. Erection of the tower and stringing completed on 30.05.2016. Only Earthwire peak of tower at location no. 12 damaged. Tower no.13 was collapsed from about 6-meter height from ground level. All stubs were intact. Tower at location No. 14 collapsed from ground level. All four stubs were damaged and need rectification. In tower at location No. 15, only earthwire peak was damaged. It was observed that coping of chimneys of foundation was not done, foundation reinforcements were visible on top of chimney, stubs were rusted, ACD and Earthing connection was not visible at location no. 13 and 14. There were deep depressions near two foundations at location No. 13 which are to be back filled with soil. Powergrid was requested to provide structural drawing and foundation drawing during the investigation. However, the same was not provided to CEA even after repeated requests.

4. EXTREME WIND

220KV D/CKakrapar – Haldarwa Transmission Line failed on 04.07.2016 (Towers at location No. 7(DD+0) and 8(DC+3))

Brief Background

The line was commissioned on 01-12-1992. Construction of the line was carried out by M/s Gujrat Electricity Board on deposit work basis and subsequently handed over to POWERGRID. This line was under satisfactory operation for the last 24 years and such type of tower failures were not observed in past. The line tripped at around 17:41 Hrs. on 04.07.2016 due to collapse of towers at location no. 7 & 8 during heavy windstorm and rain. The towers were designed according to old IS 802:1977.

Observations

The location of failure was approximately 1.7 kms from Kakrapar end of transmission line and was situated in cultivated land near village Rajwad, Tehsil: Mandvi, Surat. The site was accessible through Ahmedabad- Mumbai highway and village roads. The tower at loc. No. 7 collapsed in the traverse direction and chimney at this location had came out from 2 pits. The tower at loc. No. 8 was in hanging condition as one chimney came out due to the sudden jerk caused by tower collapsed at location no 7. The towers were checked thoroughly for missing/ theft of tower members and bolts & nuts and no tower members were found missing. Adjacent towers in the vicinity were also checked and no missing members were observed.

Probable Cause of Failure

Due to localized heavy wind conditions in the vicinity of transmission line with wind blowing in the transverse direction of line, tower at location no. 7 might have failed. The uprooting of two chimneys at location no. 7 and one chimney at location no. 8 could be due to improper soil investigation and deficiency in foundation design.

Restoration

Line was restored on normal towers on 20.07.2016. The Committee advised Powergrid to check the soil investigation report and foundation design of the failed towers. PGCIL was also requested to submit material test report of the failed tower members.

Failed tower at location no. 7

Failed tower at location no. 8

SILTATION AND EROSION

Wind Responses of Transmission Tower-Line System

Transmission tower connected by many lines has more complex structural geometries and behaviour than common self-supported towers. Transmission tower-line system is a typical wind sensitive structure and wind loading often controls the structural design of transmission tower-line system [20, 21]. The response of structures to wind action may involve a wide range of structural actions, including resultant forces, bending moments, cable tensions, and deflections and acceleration. The transmission lines, being relatively slack under dead load, together with the behaviour of the tower and the conductors make the system very nonlinear. It was considered that since time history analysis takes into account nonlinearity this analysis is more accurate than the multimodal spectral analysis.

typical broken strand due to aeolian vibration after removal of suspension clamp.

GALLOPING

Galloping of overhead transmission lines has been under investigation for a long time in the industrial aerodynamics field and is still awaiting solution. It is important to understand the effects of wind turbulence on galloping and to establish an evaluation method for galloping of transmission line in gusty wind. Ohkuma and Marukawa [39] investigated the galloping of overhead transmission

lines in gusty wind. They discussed the differences between galloping in smooth wind and galloping in gusty wind through a numerical simulation focusing on their behavior rather than their mechanisms. In addition, Verma and Hagedorn [40] developed a modified approach of the energy balance principle by taking into account in-span damping (Figure 5). The complex transcendental eigenvalue problem was solved for the conductor with in-span fittings. With the determined complex eigen values and eigen functions, a modified energy balance principle was then used for scaling the amplitudes of vibrations at each resonance frequency. Bending strains are then estimated at the critical points of the conductor.

LIGHTNING STRIKES

Lightning accounts for about 60% of all transmission line trippings in China and is closely linked to season as well as region. Based on the physical processes, lightning over voltage's can fall into two broad categories: those caused by direct strike to the tower, shield wire or conductor; and those where lightning strikes the ground near lines, generating an induced over voltage on conductors. Experience demonstrates that the former imposes the far greater hazard and that the latter most threatens lines of 35 kV or below.

Based on where a line is hit, over voltage's from direct lightning strike are also of two types. In the first case, lightning strikes a point on the tower or shield wire and the resulting current causes its potential to ground to rise significantly. When this difference in potential between lightning strike point and conductor exceeds the lightning impulse discharge voltage of the line's insulation, flashover or breakdown of the air gap occurs. By contrast, should the absolute value of the tower or shield wire potential at the moment of lightning strike be higher than that of the conductor, there is back flashover. In the second case, over voltage's generated by lightning bypassing the shield wire and striking the conductor are shielding failures.

The performance of a system's lightning protection can be measured using two indices – lightning withstand level and lightning related tripping rate. The former refers to the maximum amplitude of lightning current (in kA) that the line can withstand without leading to insulation flashover under direct lightning strike. The higher this is, the better will be the line's lightning performance. Lightning related tripping rate, by contrast, refers to the number of trips on a line (per 100 km/year) under standard conditions or after being converted to the equivalent of 40 lightning days per year. Lightning tripping rate is therefore a comprehensive index of a line's lightning protection performance.

Since shield wire is installed along the entire length of a line of 110 kV and higher, it has been widely assumed that lightning related trippings on such lines were due mainly to back flashover and incidence of shielding failure was lower. Recent statistics from China demonstrate the opposite. A few years ago, the lightning related tripping rate on lines operated by the State Grid Corporation was 865, of which 592 (68.4%) were due to shielding failure, 269 to back flashover and 4 to other causes. Moreover, trippings of 750 kV and ±500 kV lines were all due to shielding failure. Indeed, comparative rates of shielding failure as a proportion of all lightning trippings on 66 kV, 110 kV, 229 kV, 330 kV and 500 kV lines in China were 1.6%, 58.4%, 76.1%, 80%, 95.1%, respectively, i.e. the higher the voltage, the higher the percentage of shielding failure related trippings. In one recent year, for example, lightning related trippings in China numbered 741, of which 520 (70.2%) were due to shielding failure, 209 to back flashover and 12 to other factors. Again, the higher the voltage, the higher was the percentage of shielding failure trippings.

Measures to increase the lightning withstand level of a transmission line and reduce lightning related hazards include: decreasing grounding resistance of towers; adjusting protection angle of the shield wire; using a lightning protection differentiation design for double circuit towers; installing additional

lightning rods or line surge arresters (TLSAs) in areas with highest risk. Moreover, using lightning monitoring equipment helps in locating and replacing damaged insulators in a timely manner

Line arresters can significantly reduce lightning related trippings and their practical application has proven remarkably effective. If their cost can be reduced, they would probably be used more widely. At the same time, 1000 kV UHVAC lines have an additional shield wire installed above the centerphase conductor on critical sections to increase withstand performance and reduce lightning shielding failures.

It's also important to increase the lightning withstand level of insulators. Since composite insulators offer superior withstand to pollution flashover, their insulation distances are often shorter than for equivalent porcelain or glass strings. Moreover, a composite insulator's grading ring's lightning withstand level may be relatively low. Given that the lightning withstand level of 110 kV lines is already low, the net negative impact on lightning performance when composite insulators are specified can be significant. Chinese power companies have already noticed this problem and their specification of composite insulator lengths is no longer based solely on pollution flashover performance and takes into account the effect on lightning withstand level. Still, as long as the air gap between the grading rings of composite insulators is not less than that on porcelain or glass strings, the line's lightning withstand level will not decrease.

Finally, any consideration of lightning related hazards to lines must consider not only lightning related tripping rate but also failure rate due to lightning. If reclosing is successful on a line struck by lightning, no interruption in service will result. Given this, installing parallel-connected protection gaps on insulator strings helps keep the arc from a lightning flashover far enough from the surface to avoid interruption due to damaged insulators. The Electric Power Research Institute in Beijing has conducted extensive research on such gaps and this measure should be widely promoted in China as well as elsewhere.

Even when protected in the above manner, the flow of the pulse of lightning current in the shield wire causes an induced voltage pulse in the phase conductors. These being much smaller in value than the direct pulse safely pass along the line without causing any insulation failure. To protect the equipment at the termination point of the overhead lines (such as circuit breakers, transformers, measuring devices, etc.), lightning surge arrestors are provided at the point of termination. These arrestors absorb any surges in the line and prevent them from traveling into the substation equipment.

These arrestors are essentially non-linear resistors in a porcelain housing which at normal voltages present a very high resistance. They are designed to break down at voltages above the highest system operating voltage (but lower than the basic insulation level of the system) thereby becoming good conductors and pass the energy of the lightning impulse to the ground. Once the voltage comes down (after the discharge of the pulse is over) the arrestors return to their original high-impedance state.

The arrestors are placed on structures and their line terminals connected to each phase of the line. The other end of the arrestor (ground terminal) is connected to the substation grounding system through short ground conductors of adequate cross-sectional area.
Arrestors can also be optionally provided with surge counters for the purpose of monitoring their action.

9. LANDSLIDES

220 kV D/C Mariani-Mokokchung Transmission Line failed on 12.07.2016 (Location no. 56 (DC+3) & 57 (DC+0))

Brief Background

The line was constructed as part of Palatana transmission project. Construction of the line was done by M/s C&C Ltd. Total line length is 49 km. Towers for the line were supplied by M/s Steel Products Limited, Kolkata. 220 kV towers designed by M/s RPG for wind zone 4 (47 m/s) with single Zebra conductor as per IS 802:1995. The line was commissioned on 17.07.2015. This was the first tower failure in the line. The 220KV Mariani-MokokchungCkt-II transmission line tripped on 12.07.2016 at 01:11 Hr.

Observations

The line tripped with indication of fault at 24.5 km from Mariani end (Zone-1, R-Y phase) and with indication of Zone-1, R-Y-B phase fault at Mokokchung end. During this period Mariani-Mokokchung Ckt-1 was opened due to high voltage. The line tripped on SOTF when attempted to charge the line from Mariani end. Subsequent to deployment of off line fault locater followed by ground patrolling, it was observed that heavy landslide has occurred in the stretch covering tower location 56 & 57(Chanki area in Nagaland) of the transmission line. Complete deformation of the bottom part of tower & damage to foundation of tower at location no 56 (DC+3) had taken place, resulting in complete failure of the tower. In the tower at location no. 57 (DC+0), deformation in leg members of first and second section of tower and its foundation had taken place due to complete sliding away of the supporting soil. It was observed that massive landslide had taken place at various stretches in the entire hill accommodating the tower locations from 52 to 59. Further, the situation was aggravated by the continuous rainfall in the area during the last few weeks.

Failure of tower at location no. 56

Landslide near the location no. 57

Probable Cause of Failure

Report on failure of Transmission line towers during the period December 2015 to September 2016 33. The failure of towers might have been caused by the landslides triggered by continuous rain for few weeks. The landslide might have caused the complete sliding away of the supporting soil which might have caused the deformation in tower. Failure of tower at location no. 56 Landslide near the location no. 57 Restoration The stability of soil strata near existing location 56 & 57 having been completely disturbed, the casting of new foundations in their vicinity is not viable. As such, establishing a direct connectivity between location 55 &58 , thereby avoiding the completely instable stretch from location 56 to 57 is found to be a suitable option. In view of span limits of the existing towers at location nos. 55 & 58, towers of suitable design shall have to be installed at location 55 & 58 to avoid the unstable stretch.

Considering the steep slope and instability in the are due to landslides, restoration of line on ERS was not feasible. The power flow of the line was diverted through 132 kV MarianiMokokchung line of Nagaland State electricity department. Permanent restoration of the line was under progress and expected by December 2016.

Committee noted the above and suggested Powergrid to explore the possibility of providing protection/ retaining wall for foundation of towers in hilly terrain to avoid such incidences in future.

10. FLOODING

400 KV D/C (QUAD) Kishanganj - Patna transmission line failed on 26.07.2016 (Location No. 51(DD+18))

Brief Background

400 kV D/C(Quad) Patna-Kishanganj transmission line was constructed by M/S EMC in year 2016 under the transmission system scheme for transfer of power from generation projects in Sikkim to NR/WR(Part-B) scheme The towers of this line have been designed for Wind Zone-IV as per IS:802-1995. The length of the line is 346.72 Km. The line was commissioned on 28-03-2016 and this is the first failure of the line after commissioning. The line was taken under shut down on 26.07.2016 from 09.56 Hr, for line crossing works near Patna Substation. At about 12.00 Hrs. line maintenance

employee received a phone from the Mukhia of Simalbadi village that tower at location no. 51 of this line collapsed in river Kankai. The line was taken under shutdown and during patrolling, it was observed that one CENTRAL ELECTRICITY AUTHORITY Report on failure of Transmission line towers during the period December 2015 to September 2016 34 tension tower (DD+18) at location no. 51 of this line has completely fallen and partly submerged due to flash flood in nearby Kankai river. The tower is situated near village Simalbadi approximately 55 km from Purnea sub-station.

Observations

The team of officers from Powergrid and CEA had visited the site of failure on 29.07. 2016.It was observed that houses, agricultural fields nearby the failed tower location were badly affected by flood water and the affected location in the right bank of Kankai river was only accessible through boat. The Collapsed tower at location no.51 was partially (two foundations) submerged in water at the time of visit of team. The stub of one leg had bent and the other sheared. This tower was erected on normal foundation (FS type). As per the data/map available, the Kankai river was flowing about 128 meters away from the tower Location no.51 in 2014. Committee enquired regarding the theft of the members for the collapsed tower. It was informed by the site that there was no theft of the tower members. No missing tower members were observed in the collapsed tower. There was no wind storm on the day of failure.

The water level data of Kankai river at Chardariya Gauging Station of Central Water Commission shows that the water level crossed the danger level of 46.90 m and reached the maximum level of 47.430m on 26.07.2016, the day of failure. District Magistrate, Purnea had visited the village during the floods, prior to the failure of the tower and inspected the flood protection works at river bank.

Probable Cause of Failure

Tower at location no. 51 might have collapsed due to erosion of soil below the foundations i.e. due to failure of foundation at Leg 'C' & 'D'. The intensity of the flash flood was severe enough to wash away the foundations of the collapsed tower.

Restoration

Restoration of line on normal tower is in progress.

It is also not possible to reroute the line beyond the flood plain of the river as all possible routes on the left and right of the current alignment is also in the meandering zone of the river. Rerouting of line will increase line length and pile foundation cannot be avoided in the alternate route.

Report on failure of Transmission line towers during the period December 2015 to September 2016 35 Considering the fact that the affected location will be under constant threat of being washed away by the Kankai river, whose course is quite unpredictable, the team of experts from CEA & PGCIL had suggested for providing pile foundation at location no. 51 as a permanent measure.

After deliberation the committee advised PGCIL to consider the use of Pile foundation at location no.51 after soil investigation in view of threat from Kankai river.

11. DROUGHT/FOREST FIRE

Transmission lines often pass through mountainous areas where forest and brush fires have become a growing threat given factors linked to climate change. This has made wildfire an increasingly important risk in line trips and outages.

Occurrence of wildfires is both regional and seasonal. During dry months mountains and hilly areas are only sparsely populated with vegetation and at greatest risk. Indeed, during certain times of year, mountain fires become one the dominant hazards affecting the safe operation of overhead lines. Causes of wildfires include human activity as well as natural factors such as lightning. Another cause, not fully appreciated, is sunlight reflecting off broken glass scattered on the ground.

More research on the specific mechanisms by which mountain fires impact air gap discharge has shown that factors such as high flame temperature, increased electrons and ion concentration from flames and influence of ash and smoke on electric field can all lead to decreased air gap discharge voltage. All are therefore topics of continuing research.

Since many transmission lines run through areas where human presence is sporadic, it is vital to monitor them closely and quickly raise the alarm in the event of wildfire. Chinese utilities, for example, have taken various measures such as real-time monitoring using cameras installed in areas prone to fire. They also conduct inspections of vulnerable line sections using helicopters or unmanned aerial vehicles. In addition to emergency measures to extinguish fires quickly in the event of outbreak, it is also necessary to know how best to respond to wildfires occurring near transmission lines. Special emergency measures must be taken such as decreasing voltage on affected DC lines or, in extreme cases, taking an outage on affected AC lines.

1. EARTHQUAKES

The Seismic Response Analysis of Transmission Tower-Line System For the seismic response analysis of transmission tower-line system, the models of coupled transmission tower-line system were set up by the finite element software. According to different seismic design method, the input of the seismic waves is mainly based on the acceleration response spectrum and time history analysis method. The input of ground motion must consider spatial variation of seismic ground motions because of the distance of towers is very far. Seismic waves travel to different foundations of transmission tower will produce time delay, reflection and refraction, the filtering action of local site soil may lead to coherence loss, multi-support excitation method can be used to study the seismic response analysis.

With the help of finite element analysis software SAP2000, the transmission lines have been seen as an ideal flexible wire, the frame elements are chosen to simulate transmission line, A 500KV cat-head tower used in the practical engineering is selected, the total height of the transmission tower is 56.2m, the span of tower is 300m, the damping ratio of material to tower is 0.03, the members of tower are simulated by space beam elements, shown in figure 4.1. Steel-cored aluminium strand 4×LGJ-400/35 was chose, 4-bundle conductors were simplified as one transmission line, according to the GB/T 1179-2008《Overhead electrical conductors-Form wire, concentric lay, stranded conductors》 (International Electro technical Commission GB/T 1179-2008,1997).

The coupled transmission tower-line system Table 4.1. The technical parameters of conductor The spatial variation in the seismic response analysis must be considered due to the lager-span and high rise flexile characteristics of a transmission tower line system. In order to research traveling wave effect, coherence effect on the seismic response of transmission tower-line system, the following four cases can be chosen to research: （1）the uniform excitation;（2）the non-uniform excitation

only considered traveling wave effect; （3）the non-uniform excitation only considered coherence effect;（4）the non-uniform excitation considered both traveling wave effect and coherence effect.

The ratio of axial force to the lines It can be seen that whether the bending moment or the shear force of transmission towers which is only considered the traveling wave effect is much less than the uniform excitation, both the bending moment and the shear force increased substantially when only considered coherence effect, thus it can be seen that the influence of the coherence effect to the seismic response of transmission towers cannot be ignored. Considering the traveling wave effect and coherence effect at the same time, the results of the fourth case is close to the uniform excitation because the traveling wave effect is favorable to the structure, but the coherence effect has the adverse effect to the transmission towers. The traveling wave effect and the coherence effect are both have great effect on the seismic response, which should be considered at the same time. It can be seen from figure4-4 that the axial force from the top of tower which is affected by non-uniform seismic excitation is much less than other layer of tower. the maximum growth rate of axial force on the transmission lines is 11% under the second case, when only consider coherence effect, the maximum growth rate is 6%, it can be reach to 16% considered the traveling wave effect and coherence effect, it can be concluded that coherence effect has less influence to the axial force of transmission lines than the traveling wave effect. The seismic response of tower-line system was researched used multi-support excitation method, the earthquake input was considered traveling wave effect and coherence effect. The study shows that the effect of non-uniform seismic excitation is larger than the uniform excitation.

Appendix 9: Template for ESIA-ESMP Report

1. Introduction

1.1 Background
[Provide background information on the project and its context.]
1.2 Purpose of the Report
[State the objectives and intended outcomes of the report.]
1.3 Overview of the Project
[Give a brief summary of the project, its significance, and objectives.]
1.4 Objective and Scope of ESIA
[Define the objectives and scope of the Environmental and Social Impact Assessment (ESIA).]
1.5 Approach and Key Tasks for this ESIA Study
[Outline the methodology and key tasks undertaken for the ESIA study.]
1.6 Limitations
[Highlight any constraints or limitations faced during the ESIA process.]
1.7 Report Structure
[Provide an overview of the structure and organization of the report.]

2. Project Description

2.1 Overview of Project Site/Route
[Describe the project site, its location, and relevant characteristics.]
2.2 Profile of the Project Site/Route
[Provide details on the project site of substation and transmission line route including its alignment and associated features.]
2.3 Overview of Activities During Different Phases of the Project
[Summarize the activities planned for various phases of the project.]
2.4 Manpower Requirements and Organization Structure
[Outline the manpower requirements and organizational structure for project implementation.]
2.5 Land Requirement and Allotment Process
[Describe the land requirements for the project and the process of land allotment.]

3. Policy, Legal, and Institutional Framework

3.1 Applicable National and State-Level Environmental and Social Laws and Regulations
[Provide an overview of relevant legal and regulatory frameworks.]
3.2 International and National Labour Laws
[Outline the applicable labor laws relevant to the project.]
3.3 Relevant AIIB Safeguard Requirements
[Discuss any safeguard requirements stipulated by relevant financing institutions.]

4. Current (Baseline) Environmental and Social Status

4.1 Location Characteristics
[Describe the characteristics of the project location.]
4.2 Study Area
[Define the boundaries and scope of the study area.]
4.3 Physical Environment Baseline of the Study Area
[Present baseline data on the physical environment of the study area.]
4.4 Ecological and Biological Environment – Biodiversity, Flora and Fauna
[Provide information on the biodiversity of the study area.]
4.5 Socio-Economic Environment Baseline of the Study Area
[Describe the social environment and relevant socio-economic indicators.]

5. Analysis of Alternatives

5.1 Environmental and Social Criteria for Site/Route Selection
[Outline the criteria used for evaluating alternative routes.]
5.2 Evaluation of Alternative Sitefor substation/Route Alignment for associated Transmission Lines
[Present the analysis and evaluation of alternative route alignments.]

6. Assessment for Potential Environmental and Social Impacts and Mitigation Measures

6.1 Introduction
[Provide an introduction to the impact assessment process.]

6.2 Impact Assessment Methodology
[Explain the methodology used for assessing environmental and social impacts.]

6.3 Impacts on Physical Environment
[Detail the potential impacts of the project on the physical environment.]

6.4 Impacts on Ecological and Biological Environment
[Assess the project's potential impacts on biodiversity and critical habitats.]

6.5 Impacts on Socio-Economic Environment
[Analyze the project's potential social impacts.]

6.6 Summary of Impact Assessment
[Summarize the findings of the impact assessment.]

7. Climate Risk Assessment (CRA) including Climate Risk Management Plan

[Conduct a climate risk assessment and outline the management plan for addressing climate-related risks.]

8. Environmental and Social Management Plan

8.1 Environmental and Social Management Plan
[Present the environmental and social management plan for mitigating and managing impacts.]

8.2 Institutional Structure for Implementation
[Describe the institutional setup for implementing the environmental and social management plan.]

8.3 Role of AEGCL
[Outline the roles and responsibilities of the Assam Electricity Grid Corporation Ltd. (AEGCL) in project implementation.]

8.4 Role of Environmental and Social Officer
[Define the responsibilities of the environmental and social officer.]

8.5 Monitoring and Reporting
[Detail the monitoring and reporting mechanisms for tracking project impacts and compliance with mitigation measures.]

8.6 Budget
[Provide an overview of the budget allocated for implementing the environmental and social management plan.]

8.7 Training Programme and Capacity Building
[Outline the training program and capacity-building initiatives for project stakeholders.]

9. Stakeholder Consultations and Public Disclosure

9.1 Stakeholder Identification
[Identify key stakeholders involved in or affected by the project.]

9.2 Stakeholder Mapping and Analysis
[Map stakeholders and analyze their interests, concerns, and influence.]

9.3 Stakeholder Consultations Undertaken as Part of the ESIA Process
[Describe the stakeholder consultation process conducted during the ESIA.]

9.4 Grievance Redressal Mechanism
[Detail the mechanism for addressing grievances raised by stakeholders.]

10. Recommendations and Conclusion

[Present recommendations based on the findings of the ESIA and conclude the report.]

Appendix 10: Template for Contactor's Environment and Social Management Plan

1. Project Description

1.1 Introduction

The project description provides an overview of the Project, highlighting its significance, scope, and objectives.

1.2 Project Implementation Schedule

This section outlines the approved timeline and key milestones for project implementation, detailing the phases from planning to completion.

1.3 Objectives of CESMP

This subsection should articulate the specific objectives of the Contractor's Environment and Social Management Plan (CESMP), focusing on environmental and social compliance, impact mitigation, monitoring, and stakeholder engagement.

2. Site-Specific Environmental & Social Impacts & Mitigation

2.1 Environmental and Social Impacts

This section identifies potential environmental and social impacts associated with the project, such as air and noise pollution, water and soil contamination, and impacts on communities. It should also propose mitigation measures to address these impacts effectively.

2.2 Status of Permissions/Consents for Plants and Camps

Here, you'll detail the status of all required permissions, clearances, and consents from regulatory agencies for setting up plants, camps, and equipment, ensuring compliance with legal and environmental regulations.

2.3 Machinery and Equipment

List all machinery and equipment to be used in the project, ensuring their suitability, safety, and compliance with relevant standards and regulations.

2.4 Material Sourcing

Identify vendors and subcontractors for sourcing construction materials, ensuring their compliance with statutory requirements and environmental standards.

2.5 Solid and Hazardous Waste Management

Outline strategies for managing solid and hazardous waste generated during project activities, including collection, storage, transportation, treatment, and disposal methods.

2.6 Compliance with ESIA and ESMP

Detail how the Contractor's Environment and Social Impact Assessment (ESIA) and Management Plan (ESMP) will be implemented and monitored to ensure compliance with environmental and social regulations and standards.

3. Environment and Social Monitoring

3.1 Environmental Parameters Testing Plan

This section should provide details of the testing plan for monitoring ambient air quality, noise levels, water quality, soil quality, and any other relevant environmental parameters, including sampling procedures, testing methods, and laboratory accreditation.

3.2 Environmental and Social Monitoring

Reproduce Table 42 of the ESMPF, outlining the parameters to be monitored, monitoring frequency, responsible parties, and compliance measures.

4. Labour Management Plan

4.1 Introduction

Provide an overview of the Labour Management Plan, including compliance with relevant labour laws, registration requirements, and records maintenance.

5. Health and Safety Management Plan

5.1 Introduction

This section should introduce the Health and Safety Management Plan, emphasizing its importance, objectives, and adherence to relevant safety standards and norms.

5.1.1 Objectives

Detail specific objectives and targets of the Health and Safety Management Plan, focusing on the prevention of accidents, injuries, and occupational health hazards.

5.1.2 Safety Standards

Provide details of applicable safety standards and norms, such as Occupational Health and Safety (OHS) standards, International Finance Corporation (IFC) guidelines, and local electricity regulations.

5.2 Safety Function

Outline the responsibilities and procedures for implementing safety measures, including staffing requirements, safety protocols, and emergency response procedures.

5.2.1 Primary Health Care

Detail plans for providing primary health care services to workers, including assessment, arrangements with nearby hospitals or clinics, and management of occupational health issues.

5.2.2 Occupational and Community Health

Describe plans for managing occupational health risks and addressing community health concerns related to project activities.

5.2.3 HIV/AIDS and COVID-19

Outline measures for raising awareness and preventing the spread of HIV/AIDS and COVID-19 among workers and communities, including risk management protocols and awareness programs.

5.2.4 Health Checkup

Detail arrangements for regular health checkups for workers, including frequency, procedures, and coordination with healthcare professionals.

5.2.5 Labour Camp Health and Hygiene Issues

Address health and hygiene concerns in labour camps, including provisions for clean water, sanitation facilities, waste management, and hygiene promotion.

5.2.6 Work at Heights and Acrophobia Test

Provide procedures for safely conducting work at heights, including acrophobia tests and other relevant safety assessments.

5.2.7 First Aid

Detail arrangements for first aid provision, including first aid kit contents, training for personnel, and maintenance of medical records.

5.2.8 Health Hazards

Identify and address potential health hazards arising from project activities, including measures to protect both workers and nearby communities.

5.3 Risk Assessment Plan and Mitigation Measures

5.3.1 General

Outline general risk assessment procedures and mitigation measures to minimize health and safety risks throughout the project lifecycle.

5.3.2 Reporting Unsafe Acts/Conditions/Accidents/Incidents

Establish protocols for reporting and addressing unsafe acts, hazardous conditions, accidents, incidents, and near misses promptly to prevent recurrence and ensure continuous improvement in safety performance.

5.3.3 Jewellery and Clothing

Specify requirements for personal protective equipment (PPE), including rules regarding jewellery and appropriate clothing to mitigate safety risks.

5.3.4 Barriers and Signage

Detail the installation of barriers and signage to delineate hazardous areas, control access, and communicate safety instructions effectively.

5.3.5 Housekeeping and Storage

Establish guidelines for maintaining clean and organized work areas, proper storage of materials and equipment, and waste management practices to prevent accidents and hazards.

5.3.6 Vehicle Safety & Traffic Rules

Implement measures to ensure vehicle safety and adherence to traffic rules within project sites to minimize the risk of accidents and injuries.

5.3.7 Personal Protective Equipment (PPE)

Specify the types of PPE required for various tasks and activities, along with procedures for selection, provision, maintenance, and use to protect workers from occupational hazards.

5.3.8 Lockout and Tag Out (LOTO)

Detail procedures for isolating energy sources during maintenance and repair activities to prevent accidental startup or release of hazardous energy.

5.3.9 Electrical Safety

Outline general requirements and precautions for working safely with electrical equipment and installations to prevent electric shock, burns, and other electrical hazards.

5.3.10 Hand Tools, Portable Equipment, and Lighting

Specify safety requirements and procedures for the use of hand tools, portable equipment, and lighting to minimize the risk of injuries and accidents.

5.3.11 Abandoning Cable

Establish protocols for safely abandoning cables to prevent electrical hazards and ensure compliance with regulatory requirements.

5.3.12 Operations Adjacent to Overhead Lines

Provide guidelines for conducting operations near overhead power lines to prevent contact and electrocution hazards.

5.3.13 Fire Safety

Detail measures for fire prevention, fire suppression, and emergency evacuation procedures to ensure the safety of workers and protect property from fire hazards.

5.3.14 Crane & Lifting Safety

Outline safety protocols for crane and lifting operations to prevent accidents and injuries related to material handling and lifting activities.

5.3.15 Mock Drills

Establish procedures for conducting mock drills to test emergency response plans, evaluate readiness, and train personnel in responding to various emergencies effectively.

5.3.16 Housekeeping of Sites

Detail requirements for maintaining clean and orderly work sites to minimize hazards, improve productivity, and promote a safe working environment.

5.3.17 Safety Inspection

Specify procedures for conducting regular safety inspections to identify hazards, assess risks, and implement corrective actions to ensure compliance with safety standards and regulations.

5.3.18 Safety Audits

Detail procedures for conducting periodic safety audits to assess the effectiveness of safety management systems, identify areas for improvement, and ensure continuous improvement in safety performance.

5.4 Work During Monsoons

Provide guidelines and procedures for safely conducting project activities during monsoon seasons, including measures to mitigate risks associated with heavy rainfall, flooding, and adverse weather conditions.

6. Traffic Management Plan

6.1 Traffic at Construction Site

Detail measures for managing traffic flow and ensuring safety at construction sites, including traffic signage, designated traffic routes, and coordination with local authorities.

7. Community Health and Safety

7.1 Introduction

Introduce the importance of community health and safety considerations in project activities, emphasizing the need to minimize impacts on local communities and promote positive interactions.

7.2 Stakeholder Groups

Identify relevant stakeholder groups, including local communities, authorities, and other interested parties, and outline strategies for engaging with them to address their concerns and ensure their safety.

7.3 Awareness Program

Develop an awareness program to educate stakeholders about project activities, potential risks, and safety measures, utilizing various communication tools and channels for effective outreach.

7.3.1 Communication Tools

Detail the communication tools and channels to be used for disseminating information about the project, including public meetings, newsletters, social media, and community workshops.

8. Code of Conduct

8.1 Contractors' Code of Conduct

Establish a code of conduct for contractors and subcontractors to ensure ethical and responsible behaviour throughout project implementation, including adherence to environmental, social, and safety standards.

8.2 Guidelines for Addressing GBV

Develop guidelines for addressing gender-based violence (GBV) in project activities, emphasizing zero tolerance for harassment, discrimination, and abuse, and outlining procedures for reporting and addressing incidents.

9. Grievance Redress Mechanism

9.1 Contractor Grievance Redress Committee

Establish a grievance redress committee to address concerns and complaints from workers, local communities, and other stakeholders promptly, ensuring transparency, fairness, and accountability in resolving grievances.

9.2 Grievance Register

Maintain a grievance register to document and track grievances received, including details of the issue, actions taken, and outcomes, to facilitate timely resolution and follow-up.

9.3 GRM Procedures

Outline the procedures for receiving, reviewing, and resolving grievances, including communication channels, escalation processes, and timelines for response and resolution.

10. Contractor E&S Staffing and Reporting

10.1 Staffing Details

Provide details of environmental and social (E&S) staff roles and responsibilities, including qualifications, training requirements, and reporting structures, to ensure effective implementation of the CESMP.

10.2 Reporting

Outline reporting requirements and procedures for documenting environmental and social performance, including regular reporting intervals, key performance indicators (KPIs), and communication protocols with project stakeholders.

11. Incident Reporting Format

Establish a standardized format for reporting incidents, accidents, and near misses, including details of the event, causes, and corrective actions taken, to facilitate learning and prevent recurrence.

12. Training

12.1 Introduction

Introduce the importance of training in promoting safety, environmental awareness, and compliance among project personnel, emphasizing a proactive approach to skill development.

12.2 Labour Induction

Detail the induction process for new workers, including orientation on project policies, procedures, safety protocols, and emergency procedures, to ensure their understanding and compliance with project requirements.

12.3 Proposed Training Schedule

Outline the proposed training schedule for project personnel, including topics, training methods, trainers, and training frequency, to address specific skill gaps and promote continuous learning and improvement.

13. Contingency Planning

13.1 Emergency Procedures

Develop emergency procedures and protocols for responding to various types of emergencies, including natural disasters, accidents, and health crises, to ensure the safety and well-being of project personnel and local communities.

13.2 Emergency Contact Numbers

Compile a list of emergency contact numbers for relevant authorities, emergency services, medical facilities, and key project personnel to facilitate timely communication and response during emergencies.

Appendix 11: Template for Semi-annual Environment and Social Monitoring Report

Introduction

Assam Electricity Grid Corporation Limited is a vibrant growth-oriented public sector company registered under the 'Company Act, 1956'. It was formed out of the restructured Assam State Electricity Board in 2003 and was notified as the State Transmission Utility (STU). Its core business is to efficiently transport electrical power from electrical power bulkheads to the distribution company networks in the state of Assam. Assam Electricity Grid Corporation Limited inherited 3862 circuit km of EHV lines above 66 kV voltage class and 38 numbers of extra high voltage (EHV) sub-stations having a total transmission capacity of 1636.50 MVA at its birth in 2003.

Phase-II of the project comprises construction of new 14 nos. of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines. The overall project expenditure amounts to approximately USD 490 million, with AIIB extending financial support of USD 304 million for Phase I and USD 186 million for Phase II. To integrate environmental and social concerns into Phase II of AISTSEP, AEGCL is formulating an Environmental and Social Management Planning Framework (ESMPF).

Brief Project Description

In Phase II of the AISTSE project, the focus is on expanding the state's electricity transmission capacity through the construction of new power sub-stations, associated transmission lines, and complementary infrastructure. The overarching goal is to enhance energy access for industries and businesses while concurrently minimizing transmission losses. The project aims to address the growing demand for electricity, fostering economic development and sustainability. The specific sub-projects detailed in this chapter will provide a comprehensive overview of the proposed construction activities, specifying the locations for new power sub-stations, the routes for associated transmission lines, and the related infrastructure improvements. An integral part of the initiative is the meticulous implementation schedule, ensuring timely and efficient completion of each component. Through these, Phase II endeavours to contribute significantly to the state's energy infrastructure, promoting resilience, reliability, and equitable access to power resources.

Phase II of the AISTSE project includes construction of new 14 nos. of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines. The sub-project details of AISTSEP, Phase – II is as follows:

- 11 Nos of 132/33 GIS substations along with the transmission lines of a total distance of 154 Kms
- 3 Nos of 220/132 KV substations with the transmission lines of 104 Kms stretch.

Details of Substations and Transmission Lines

Table: Details of Packages (Substations and Transmission Lines)

Package	Name of EPC Contractor	Scope of Work		Contract Award	Contract Effective Date	Location / Village / Town / Tehsil / District	Consignee / Concerned Division Official	Area as per Appendix-11 of ESMPF (in Hectare)	Area at present (In Hectare)	Slope/ Plain	Type of Land	Ownership
		S/S Details	Transmission line details in (km)									

Details of Transmission Lines

Details of transmission lines are given in the Table below.

Table: Details of Transmission Lines

Line length (in km) as per ESMPF	Line length (in km) as per Survey Report	No. of Towers	Right of Way (ROW in mts)	No. of Affected Villages	Names of the Affected Village

Project Progress Status and Implementation Schedule

Table: Physical and financial progress status of project during the reporting period

Sr. No.	Pkg No.	Effective/ Schedule Completion date	Agency	Order Value (INR Cr.)	Sub Station/ Transmission Line Name	Overall Progress	Financial Progress till 30th June, 2022 in %

Brief progress status of project

Brief progress status of project with respect to activity during the reporting period is given in the table below.

Table: Brief progress status of project

Project Component Stage	Progress Status {not yet started; on-going; completed}	Percent Completed	Remarks

Compliance to Applicable Regulations/Standards

ESIA - ESMP documentation status of each package as per approved ESMPF

Table: ESIA - ESMP documentation status of each package as per approved ESMPF

Pkg no	Location	Name of the contractor	Status of ESIA-ESMP

Mobilisation of E&S resources at each level i.e., PMU, PMC, and Contractors

Table: Mobilisation of E&S resources at each level i.e., PMU, PMC, and contractors

S.No	Name	Designation	Qualifications	Experience	Contact Details	Email ID
E&S staffs of Project Management Unit (PMU)						
E&S staffs of Project Management Consultant (PMC)						
E&S staffs of Engineering Procurement and Construction Contractors (as per CESMP)						

Compliance to Applicable Regulations/Standards

Table: Compliance to Applicable Regulations/Standards

Sl. No	Regulations / Standar ds	Compliance Requirements under the Regulation	Compliance Status {complied; not complied; Not Arises (N/A) at current stage of the project}	Remarks {provide details to show how compliance was achieved; or explain the corrective action done if there was noncompliance}
1.	The Environmental (Protection) Act. 1986, and the Environmental (Protection) Rules, 1987-2002 (various Amendments)	Consent for utilization of water from Central Ground Water Board (CGWB), if any, to use ground water for the sub-project. Consent to Establish (CTE) and Consent to Operate (CTO) for construction camps, Crusher, Batching Plant (if any) Hot Mix Plant (HMP), if any for implementation of the Project		
2.	The EIA Notification, 2006 and subsequent Amendments	Project associated activity like quarry operation (if any) for the project will require prior Environmental Clearance. (Note: The construction of substation and Transmission Line (T/L) of project does not come under Purview of EIA Notification 2006 and its subsequent		

Sl. No	Regulations / Standar ds	Compliance Requirements under the Regulation	Compliance Status {complied; not complied; Not Arises (N/A) at current stage of the project}	Remarks {provide details to show how compliance was achieved; or explain the corrective action done if there was noncompliance}
		Amendments)		
3.	Wildlife Protection Act,1972	Wildlife Clearance		
4.	Forest(Conservation) Act, 1980 and subsequent Amendments	Forest Clearance		
5.	Ancient Monuments and Archaeological sites & Remains Act 1958	Clearance from Archaeological department		
6.	The Water (Prevention and Control of Pollution) Act, 1974	Permission from CGWB for utilization of water from ground, if any, for the subproject. No Objection Certificate (NOC) for release of sewage from construction camps etc. from State Pollution Control Board (SPCB).		
7.	The Air (Prevention and Control of Pollution) Act, 1981	Consent to Establish (CTE) and Consent to Operate (CTO) for Crusher, Batching Plant (if any), HMP (if any) for implementation of the project. Ambient Air Quality Standards (AAQS) to be followed and record to be maintained.		
8.	Noise Pollution (Regulation and Control) Act, 1990 and subsequent Amendments	Ambient Noise Level to be monitored & followed and record to be maintained.		
9.	Wetlands (Conservation and Management) Rules, 2017	Clearance for Wetland		
10.	Assam (Control of Felling & Removal of trees from Non-forest Land) Rules, 2002	Felling & Removal of trees from Non-forest Land		
11.	The Motor Vehicle Act. 1988 and subsequent Amendments	Pollution Under Control (PUC) certificate from State Transport Department and SPCB for Construction Vehicles, Machineries and Equipment.		
12.	Solid Waste Management Rules, 2016	Generation of Solid Waste during project implementation.		
13.	Construction and Demolition Waste Management Rules, 2016	Generation of Construction and Demolition Waste during project implementation.		

Sl. No	Regulations / Standar ds	Compliance Requirements under the Regulation	Compliance Status {complied; not complied; Not Arises (N/A) at current stage of the project}	Remarks {provide details to show how compliance was achieved; or explain the corrective action done if there was noncompliance}
14.	Plastic Waste Management Rules, 2016	Generation of Plastic Waste during project implementation.		
15.	Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016	Generation of Hazardous and Other Wastes as per (Management & Trans boundary Movement) Rules, 2016, if any during project implementation.		
16.	E- Waste Management Rules, 2016	Generation of EWaste during construction		
17.	Batteries (Management and Handling) Rules, 2001	Generation of Batteries Waste during project implementation		
18.	The Building & Other Construction Workers (BOCW) (Regulation of Employment & Conditions of Service) Act, 1996	Regulation of Employment & Conditions of Service during project implementation		
19.	The Right to Fair Compensation and Transparency in Land Acquisition (LA), Rehabilitation and Resettlement Act, 2013 both incorporated by GoI and GoA.	LA Regulation and Rehabilitation and Resettlement (R&R) Act, 2013 has been followed at the time of Direct Purchase of Land on the basis of mutual consent between the Land owner and the requiring Body PMU (AEGCL).		
20.	The Scheduled Tribes (STs) and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006	Consent from the STs and Other Traditional Forest Dwellers, if any, and impact observed on them.		
21.	Electricity Act, 2003	The objectives of the Act are to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all.		
22.	Ministry of Power (MoP) guidelines dated 15th October, 2015 for payment of compensation toward Temporary damages in regard to ROW.	During the Power Ministry conference held on April 9 -10, 2015 at Guwahat it has been decided to constitute a committee. The recommendations laid down by		

Sl. No	Regulations / Standar ds	Compliance Requirements under the Regulation	Compliance Status {complied; not complied; Not Arises (N/A) at current stage of the project}	Remarks {provide details to show how compliance was achieved; or explain the corrective action done if there was noncompliance}
		the committee are formulated in the form of following guidelines for determining the compensation towards the damages as stipulated in section 67 and 68 of Electricity Act, 2003 read with section 10 and 16 of Indian Telegraph Act, 1885, Compensation @ 85% of Land Value as determined by the District Magistrate based on Circle rate/ Guideline Value and Stamp Act rates for Tower base area (between four legs). Land compensation in the width of ROW subject to a maximum of 15% of Land Value as determined based on Circle rate, Guide line value and Stamp Act, rates. In case of loss oftrees and crops a 60 days advance notice to be issued to the legal Cultivator for the standing crops prior to damage. Compensation for cultivator for the crop on the basis of market rate fixed by the Forest / Horticulture Department and 8 years income in case of fruit bearing tree and the timber wood tree to be compensated at the rate of market price.		
23.	The Antiquities and Art Treasures Act, 1972 and Indian Treasure Trove Act, 1878, Amended in 1949	If sudden encounter with anything valuable at any stage of project cycle.		

Compliance to Environmental and Social Covenants from the AIIB Loan Agreement

Table: Compliance to Environmental and Social Covenants from the AIIB Loan Agreement

Schedule #, Para. #	Covenant	Compliance Status	Remarks

Compliance to the Civil Work Contract Agreement

Activities with regards to Contract has been done during the reporting period.

Compliance to Environmental and Social Management Plan

Key Findings

Corrective actions

Compliance to Resettlement Action Plan and Tribal People's Plan (If any)

Table: Compliance to Resettlement Action Plan and Tribal People's Plan

Sl. No.	Abbreviated Resettlement Action Plan (ARAP) and Tribal people's plan	Compliance Status {complied; not complied; n/a at current stage of the project}	Remarks {provide details to show how compliance was achieved; or explain the corrective action done if there was non-compliance}
1.	In this project as per the guidelines of AEGCL and AIIB the Resettlement Action Plan (RAP) / Abbreviated Resettlement Action Plan (ARAP) to be prepared in case of LA and direct purchase of land on the basis of mutual consent between land owner and the requiring body PMU (AEGCL), but the above process should be followed by the rules and regulations of LA Act 2013.		
2.	Provisions for Tribal People's (if any) to be made according to the guideline		

Summary of Monitoring Results

Environmental and Social Monitoring

EPC Contractors complied the same as per requirement under the direct supervision of PMC as per contract requirement.

Capacity Building Monitoring

The details Capacity building programme are provided in Table below.

Table: Details Capacity building programme

Sl. No.	Date	Topic of Training	Participant/Organization	No. of Participant
1.				
2.				
3.				

Accident Monitoring

Accident monitoring as per requirement, if any accident occurred during the time of construction, the EPC contractor will record in their registered in the all the sites.

Implementation of Grievance Redressal Mechanism and Complaints Received

Role and responsibilities of the GRM.

Appendix 12: Generic Traffic Management Plan

1.0 INTRODUCTION AND STATEMENT OF PURPOSE

The purpose of the Traffic Management Plan is to provide guidance for the implementation of traffic management during development, operation & maintenance of Project. The Traffic Management Plan is to assist AEGCL/contractor in establishing, implementing and integrating traffic control, monitoring and mitigation measures for the project.

AEGCL/contractor shall carry out the work within the scope of the contract, directly with own employed labour and plant or with appointed sub-contractors.

All sub-contractors are required to fully support the principles of the traffic Management Plan and to cooperate with AEGCL/contractor to ensure that the overall objectives are maintained throughout the project. The Traffic Management Plan applies to all personnel working on or visiting the site.

2.0 SCOPE

The Traffic Management Plan reflect the high priority that AEGCL/contractor Management place upon the traffic management at construction zone. It also demonstrates AEGCL/contractor commitment to ensure that all reasonably practicable measures are taken to:

- Comply with the relevant statutory and Contractual traffic management requirements.
- Ensure that existing road users are not affected by the construction work.
- Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- Ensure that all construction – planning takes into account the smooth movements of all existing road users that may be affected by the work.
- Establish effective communication on Traffic diversion or detour with all relevant parties involved in the Project works.
- Effective control, Co-ordinate and monitor the activities of all traffic detours from existing highway on the Project during construction phase.
- Provide all personnel with adequate information, as needed

3.0 TRAFFIC MANAGEMENT FOR WORK ZONES

Guiding Principles & Safety Standards:

Traffic safety and temporary traffic control shall be an integral and high-priority element of the project from planning through design, construction, and maintenance. It shall comply with IRC SP 55. IRC 67. 2012, IRC 79, MORTH and IRC 62.

The purpose of work zone traffic control is to provide a safe work area for workers within the roadway, while facilitating the safe and orderly flow of motorists, bicyclists and pedestrians through the work zone. In order to avoid or mitigate road work zone safety problems, the following main safety objectives can be defined:

- Assist road users by relevant, reliable, correctly-timed and updated information, warning and guidance, to ensure proper adaptation of their behaviour:
    - Inform them about traffic disruptions, restrictions and alternative routes.
    - Warn them about the work zone and unusual conditions or hazards.

- Guide them to the path that must be followed.

- Apply traffic regulations at the work zone to achieve appropriate driver behaviour - and ensure the enforcement of regulations.
- Provide adequate protection for road workers (safe working environment) - as well as for road users, especially the more vulnerable ones (avoidance of hazardous elements and conditions, vulnerable road users.
- Inspect traffic control elements routinely and modify when necessary.
- Train all persons that select, place and maintain temporary traffic control devices.

In order to achieve the above objectives Traffic Management will be carried out both during scheduled construction work operations. The basic objective of the following guidelines is to lay down procedures to be adopted by Contractor and Subcontractors to ensure the safe and efficient movement of traffic and also to ensure the safety of workmen at construction sites.

The guiding principles to be adopted for safety in construction zone are to

i) Warn the road user clearly and sufficiently in advance.
ii) ii) Provide safe and clearly marked lanes for guiding road users.
iii) iii) Provide safe and clearly marked buffer and work zones.
iv) iv) Provide adequate measures that control driver behaviour through construction zones.

Such traffic management plans shall include provision for traffic diversion and selection of alternative routes for transport of equipment.

The objective of TMP is to provide a safe & smooth drive to road users plying on the Project Highway all the time of the day throughout the year and provide protection to the project workers when they are on the work. Obviously, it involves different situations on the highway including construction zone, lane closure, traffic diversions, etc.

Construction Zone and Its Components

This zone prepares the driver for an alert behaviour and is an essential part of any traffic control system. The warning system shall prepare the driver well in advance by providing information regarding distance, extent and type of hazard ahead so that he can gradually reduce the speed of his vehicle. The information in this zone is conveyed mostly through a series of traffic signs along its Construction Zone, or as some prefer to call Traffic Control Zone, is defined as an area of the highway which involves the conflict of the right of use between the road users and authority responsible for the maintenance/ improvement of the highway.

The Traffic Control Zone can be divided into various sub-zones:

i) Advance Warning Zone
ii) Approach Transition Zone
iii) Working Zone, and
iv) Terminal Transition Zone.

Advance Warning Zone: This zone prepares the driver for an alert behaviour and is an essential part of any traffic control system. The warning system shall prepare the driver well in advance by providing information regarding distance, extent and type of hazard ahead so that he can gradually

reduce the speed of his vehicle. The information in this zone is conveyed mostly through a series of traffic signs along its length.

Diversion: It is a component of the work zone of the road section, where the traffic movement in one or both directions are organised through a temporary road or /new carriage way constructed alongside the work zone, while construction is going on the existing carriage way. The diversion road is reconnect with the existing carriage way after the end of work zone at a safer distance.

Approach Transition Zone: The transition in this sub-zone is the area in which the traffic is steered and guided into and out of the diverted path around the work sub-zone. This is the most critical sub-zone from safety point of view since most of the movements are turning movements. The traffic in this sub-zone is mostly taken across with the help of barricades and channelisers.

Working Zone: This is the actual area where construction or maintenance is taking place and the main concern, therefore, is the safety of the workers at the site from the plying traffic. The path of the traffic must, therefore, be very clearly delineated to avoid intrusion of vehicles moving into the work area.

Buffer Zone: There should be a suitable lateral buffer area between the working zone and the main highway. An adequate buffer zone between the traffic control zone and the work zone has to be constructed as part of the plan. A buffer zone needs to be of sufficient width, with strong barriers placed between traffic and workers. Deflecting barriers should be placed where traffic will be running closely parallel to the work zone. Neither work activity nor the storage of equipment or material shall occur in this area.

Length of Various Components of Construction Zone: Depending upon the area availability the length of the work sub-zone will vary. The length of the warning and transition zones shall be governed by the speed of the approaching vehicles. Table III.1 provides the lengths of such components as recommended by IRC.

4.0 TRAFFIC CONTROL DEVICES

The primary traffic control devices used in work zones shall include signs, delineators, barricades, cones, pavement markings and flashing lights.

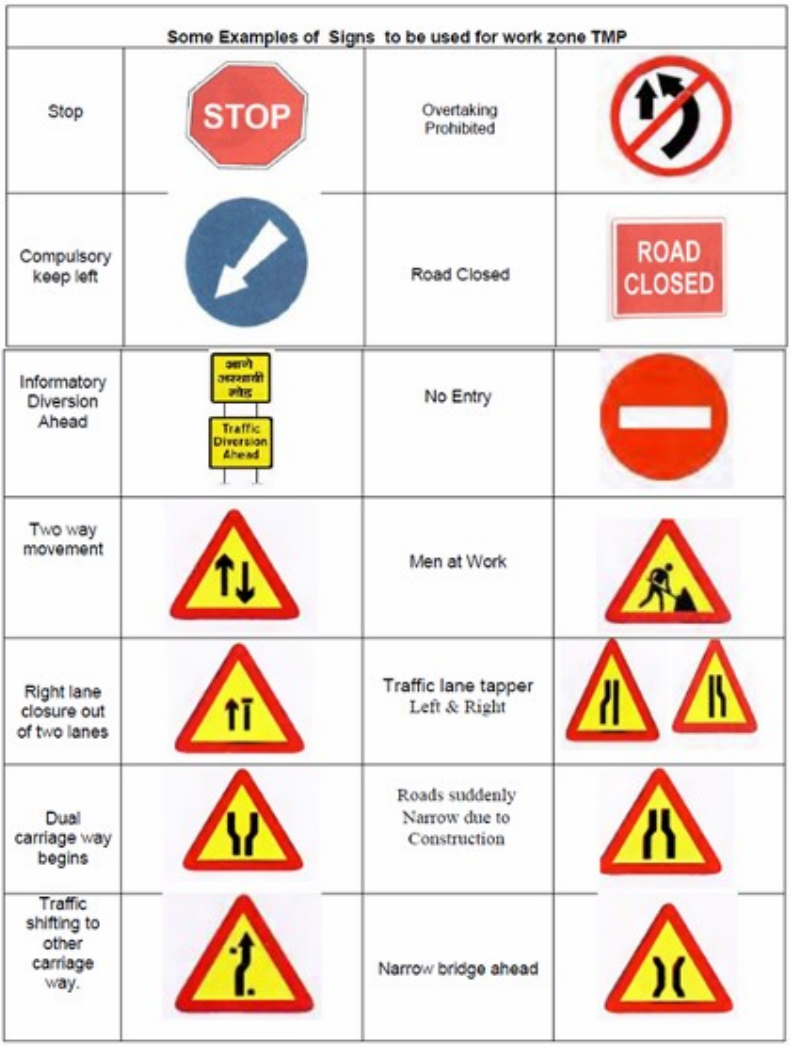
Road Signs: The road construction and maintenance signs which fall into the same three major categories as do other traffic signs that are Regulatory Signs, Warning Signs and Direction (or guidelines) Signs shall only be used. The IRC: 67 (Code of Practice for Road Signs) provide a list of traffic signs. The size, colours and placement of sign shall confirm to IRC: 67. 2012 these signs shall be placed on left hand side of the road.

Regulatory signs: Regulatory signs impose legal restriction on all traffic. It is essential, therefore, that they are used only after consulting the local police and traffic authorities. The most common types for the use in construction zones are “Do not enter”, “Road Closed”, “Give Way to Pedestrian”, “Speed Limit” etc.

Warning signs: Warning signs in the traffic control zone shall be utilised to warn the drivers of specific hazards that may be encountered.

Guide Signs: Guide signs in construction zones shall have different background colour than the normal information signs of IRC-67. These signs shall have black messages and arrows on yellow

background). These commonly used guide signs are “Diversion”, “Road Ahead Closed” and “Sharp Deviation of Route” etc.

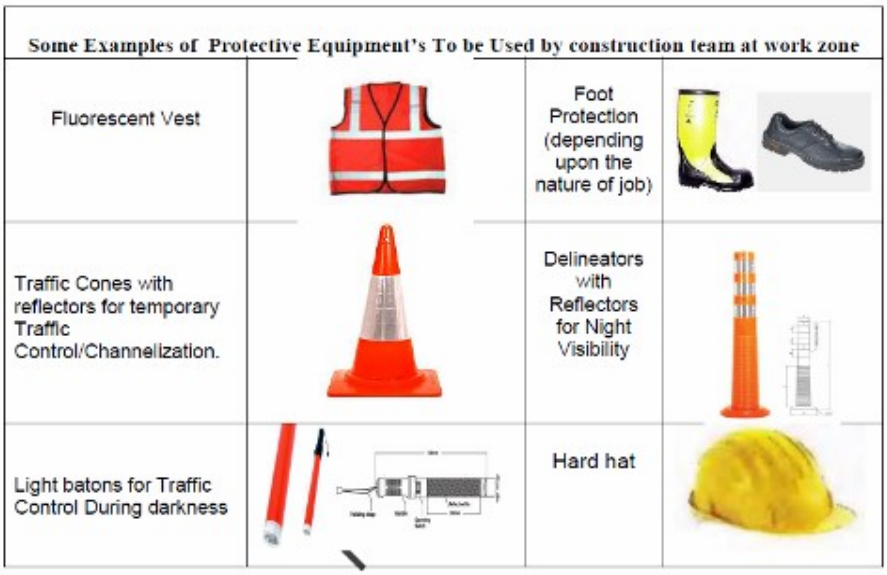


Adequate and Well-Designed Signage: The three types of signs viz., regulatory, warning, and Guide / Information, shall follow standard conventions as laid by IRC and others to aid recognition and credibility. Careful planning, installation and maintenance of road signs can contribute to the safe and efficient operation of the road network. They shall be designed to convey clear and unambiguous messages to road users so that they can be understood quickly and easily.

Miscellaneous: Detour signage shall be placed at strategic locations along with installation of appropriate warning signs. In order to minimize disruption of access to residences and business, the at least one entrance to a property shall be maintained where multiple entrances exist.

A warning sign shall be installed on a secondary road which merges with the primary road and where the construction work is in progress; at a sufficient distance before it merges with the primary road so as to alert the road users regarding the “Work in Progress”.

Materials hanging over / protruded from the chassis / body of any vehicle especially during material handling shall be indicated by red indicator (red light/flag) to indicate the caution to the road users.



Road Markings: Traffic flow and safety are almost invariably improved if traffic streams are separated into clearly marked lanes by the use of road markings. Lane lines allow drivers to locate the vehicle laterally on the roadway, and thus assist in avoiding collisions with both roadside objects or straying on to the roadside. These are particularly helpful in conditions of poor visibility such as at night or under adverse weather conditions such as in fog or rain. It has now been well established that delineation of the outside edge of the travel lane is highly desirable, especially for roads wider than 6 m. Therefore, steps be taken to provide proper road markings and maintain those well always. Provide markings on each category of roads whether it is existing road waiting to be upgraded, an upgraded road section being used as a diversion or a temporary diversion as a part of the traffic management for the work zone.

It is necessary to provide adequate visual information to the driver to control and navigate the vehicle, and also to enable the pedestrian to safely walk to the intended destination. All the median kerbs should, therefore, be properly painted as per IRC guidelines and should always be maintained well. The over grown shrubs spreading onto the carriageway should be trimmed to provide good delineation.

DELINEATORS: The delineators are the elements of a total system of traffic control and have two distinct purposes:

i) To delineate and guide the driver to and along a safe path
ii) As a taper to move traffic from one lane to another.

These channelizing devices such as cones, traffic cylinders, tapes and drums shall be placed in or adjacent to the roadway to control the flow of traffic. These should normally be retro-reflectors complying with relevant standards.

TRAFFIC CONES: Traffic cones of 500mm, 750mm and 1000mm high and 300mm to 500mm in diameter or in square shape at base and are often made of plastic or rubber and normally have retro-reflective red and white sleeve shall be used, wherever warranted.

Traffic Cones shall have suitable anchoring so that they are not easily blown over or displaced. It might be preferable to use double cone i.e. one above the other. The cones shall be placed close

enough together to create an impression of continuity. Larger cone can be used where speeds are high or where a more conspicuous guidance is required.

DRUMS: Drums about 800mm to 1000mm high and 300mm in diameter can be used either as channelizing or warning devices. These are highly visible, give the appearance of being formidable objects and, therefore, command the respect of drivers.

Empty bitumen drums (made of metal) cut to the required height can be used for channelizing devices since they are highly visible, give the appearance of being a formidable objects, thereby commanding the respect of the drivers. These drums can also be of plastic which are lighter, easy to transport and store. As delineators, these drums shall be about 0.80 to 1 m high and 0.30 m in diameter. They shall be painted in circumferential strips 0.10 m t0 0.15 m wide, alternatively in black and white colours.

BARRICADES: Traffic barriers protect workers and reduce the need for many other traffic control devices and police presence. The cost of furnishing and removing temporary traffic barriers on long-duration projects can often be less than the cost of periodically relocating other traffic control devices and providing a higher level of police presence. Traffic barriers may also provide greater night time visibility of work areas or traffic shifts.

Full height fence, barriers, barricades etc. shall be erected around the site (s) in order to prevent the working area from the risk of accidents due to speedy vehicular movement as well as to protect the road users from the danger due to construction equipment and other temporary structures.

In order to provide protected areas, segregated from road traffic, all work areas shall be barricaded with portable or permanent barricades of suitable material according to IS Code. The barricades shall be heavy and strong enough to withstand strong winds.

The barricades shall be paint marked with alternate yellow/black stripes sloping at 450 towards the direction of traffic.

A gate or movable section should be provided to allow the movement of personnel and machinery. The movements of personnel and machinery from the work area to the road where traffic is joining shall be properly controlled.

The work area shall be demarcated by blinker lights placement during dark hours and inclement weather. All barricades shall be conspicuously seen in the dark/night time by the road users so that no vehicle hits the barricade. Visibility shall be ensured by affixing retro reflective stripes of required size and shape at appropriate angle at the bottom and middle portion of the barricade at a minimum gap of 1000mm. In addition, minimum one red light or red light blinker or reflectors should be placed on the top of barricades at regular intervals.

Where it is authorised by the relevant authority for vehicles ferrying materials to the worksite to be parked outside the barricaded work zone, suitable safety measures should be taken. Such measures should include cordoning off such parking areas and suitable warning signs, lights and flagman should be provided.

Where it is absolutely necessary for construction machinery to carry out work from outside the hoarded area, the operating area of the machine outside the area should be cordoned off and suitable warning signs and lights and flagman should be provided.

Barriers to prevent pedestrians from entering construction zones should be continuous and constructed of rigid materials in order to be discerned by pedestrians with vision impairments. The use of "caution" tape or other measures is not acceptable for defining a pedestrian route since these materials are easily broken and do not adequately direct pedestrians into the temporary pathway. Scaffolding and other construction fencing should not have objects that protrude into the clear head space for pedestrians. Temporary work on sidewalks also needs to be barricaded.

FLAGMEN: A flagger may be necessary to alert traffic, or to stop traffic intermittently, as required by the progress of work in a work zone. In large construction sites, flagmen with flags and sign paddles shall be effectively used to guide the safe movements. No employees shall be utilized as a flagger until the employee has shown conclusively to their Supervisor that they realize fully the importance of the job, and understands the duties and responsibilities associated with it. The flagger's only job is work zone protection and traffic control. The flagger must never assist the crew with work activities, or engage in any distraction, and must remain on duty until properly relieved.

Flaggers shall be placed where approaching drivers can easily see them and never placed in shadows or where other workers may be close to them. Their station must have an escape route.

Flaggers shall be trained to gain and maintain eye contact with motorists and to be courteous but firm when communicating with drivers by both word and gesture. They must be dressed in bright warning vests.

Flaggers will be used in the following situations:

- One lane is alternately used for both directions of traffic.
- The roadway is closed for a brief period of time.
- Traffic speeds need to be substantially reduced.
- Inadequate sight distance hinders advance warning.
- Information, such as changing conditions, needs to be conveyed to motorists.
- Opposing traffic needs to be controlled at an intersection.
- Installing and removing other traffic control devices.
- Where conditions require unusual precautions.

During some work situations, the TCP supervisor may have to place flaggers at the beginning of, or in the activity zone. Alternatives to flaggers should always be used when hazardous conditions such as limited visibility or high-speed traffic are present. If flaggers must be used, they must be adequately trained before assuming their duties.

In more complex situations it may be necessary to place a Spotter at some locations. A Spotter is a person with the same qualifications of the flagger. A spotter may be required to warn workers of errant vehicles, danger from traffic, or to assist drivers of work vehicles in entering or leaving work sites or in performing U-turns.

The flags for signalling shall be 600mm x 600mmm size, made of a good red cloth and securely fastened to a staff of approximately 1m in length. Wherever practicable sign paddles shall be used.

MISCELLANEOUS

It shall be ensured that all construction vehicles plying on public roads (like dump trucks, trailers, etc.) have proper permit/registration to ply on public roads from the State Transport Authority.

Drivers holding proper valid license as per the requirements of Motor Vehicles Act shall only drive these vehicles.

AEGCL/its sub-contractor shall not undertake loading and unloading at carriageways obstructing the free flow of vehicular traffic and encroachment of existing roads applying the excuse of work execution. All construction workers should be provided with high visibility jackets with reflective tapes. The conspicuity of workmen at all times shall be increased so as to protect from speeding vehicular traffic.

In all cases, AEGCL shall employ proper precautions. Wherever operations undertaken are likely to interfere with public traffic, specific traffic management plans shall be drawn up and implemented by FEPL in consultation with the approval of local police authorities and/or the concerned metropolitan/civil authorities as the case may be.

5.0 SAFETY MANAGEMENT DURING CONSTRUCTION PERIOD

Measures for providing safe movement of traffic in some of the most commonly occurring work zones on highways shall be as described in the following sub-sections:

Access to Sites Temporary Diversion:

- Depending on the work space at site pedestrian and vehicular access shall be separated.
- Adequate and appropriate signs shall be posted on all routes.
- Routes shall be free of obstructions/ tripping hazards.
- Ladders used, as access to heights shall be placed away from vehicle/equipment and secured at top.

Detour on Temporary Diversion:

In the case of major repairs or works on a highway section, traffic may have to pass on a diversion, moving parallel to the highway.

A temporary diversion road should basically satisfy the following requirements:

i) It shall have smooth horizontal and vertical profile with smooth vertical and horizontal curves.
ii) It shall not get overtopped by flood or drainage discharge under any conditions.
iii) It shall have adequate capacity to cater for the diverted traffic.
iv) It shall be dust free and shall ensure clear visibility at all times of day and night.
v) It shall be provided with the required safety standards, and
vi) It shall be provided with suitable barricades to prevent intrusion affecting the movement and safety of the traffic.

The warning signs for the construction ahead shall be provided by the sign “Men at Work” about 1km earlier to the start of the work zone. In addition, a supplementary plate indicating “Diversion Ahead” (With distance) and a sign “Road Closed Ahead” shall be placed. It should be followed by compulsory “Turn Right/Left Sign”. The “Diversion” and “Sharp Deviation” sign shall be used to guide the traffic into the diversion. Hazard markers will be placed just where railings for cross drainage structures on the diversion starts.

In a construction zone that carries considerable traffic, it is often preferable to provide a route which will take the traffic around the construction zone. If the Contractor is proposing a detour, as part of his traffic control, the complete design of the detour would be the Contractor's responsibility. It is usually necessary to obtain local government approval when city streets are used for detours. It is desirable that both ends of the detour are visible to approaching motorists.

Transitions should not be in close proximity to horizontal or vertical curves, structures, or any obstruction which would interfere with the motorist's view of the transition. One ideal situation is to locate entering transitions on far sides of sag vertical curves so that the complete detour is visible (like a huge map) to the motorists. Detour plans call for a great deal of thought, planning, and on-the ground investigation**.**

Carriageway Repairs

When the work is of small magnitude, to be done in the middle of the carriageway, such as minor repairs of potholes, cracks and patches, then the traffic control measures shall mainly consist of providing cautionary signs of "Men at Work", well ahead work zone for the approaching vehicle. Other cautionary sign of "Road Narrows" shall be placed at 100 m ahead of the work area. Regulatory sign of "Keep Left/Right" shall be placed at the commencement point of work zone and next to barriers for approaching vehicles.

Moveable type of barriers shall also be placed on both sides of the work area. Cones or drums shall be placed at suitable interval to demarcate the work area.

Appendix 13: Labour-Camp Management Plan

The scope of this guideline pertains to the sitting, development, management and restoration of construction and labour camps to avoid or mitigate impacts on the environment. The area requirement for the construction camp shall depend upon the number of labour employed and the extent of machinery deployed. The following sections describe the siting, construction, maintenance, provision of facilities in the camps and finally rehabilitation of the construction and labour camps. These are described in three stages i.e., preconstruction, construction and post-construction stage.

PRE-CONSTRUCTION STAGE

Identification of sites for construction and labour camps is the first task. The Contractor shall identify the site for construction camp in consultation with the individual owners in case of private lands and the concerned department in case of Government lands. The suitable sites shall be selected and finalized in consultation with the Engineer-in-charge. **Table B** gives the lands that could be avoided for construction camps and conversely those that could be preferred.

The contractor will work out arrangements for setting up his facilities during the duration of construction with the landowner/concerned department. These arrangements shall be in the form of written agreement between the contractor and the landowner (private/government) that would specify:

- Photograph of the proposed campsite in original condition;
- Agreement of land document acquired for labour camp and compensation amount for the use of specific land for mentioned timeframe.
- Activities to be carried out on the site;
- Environmental mitigation measures to be undertaken to prevent land, air, water and noise pollution;
- Detailed layout plan for development of the construction and labour camp that shall indicate the various structures to be constructed in the camp including temporary drainage and other facilities; and
- Restoration plan of campsite to previous camp conditions.

The arrangements will be verified by the Engineer-in-charge to enable redressal of grievances at a later stage of the project.

Table No. B: Selection Criteria for Campsite

Avoid the following	Prefer the following
Lands close to habitations Irrigated agricultural lands. Lands belonging to small farmers. Lands under village forests. Lands within 100 m of community water bodies and water sources as rivers. Lands within 100 m of watercourses. Low-lying lands. Lands supporting dense vegetation. Grazing lands and lands with tenure rights. Lands where there is no willingness of the landowner to permit its use.	Wastelands. Waste Lands belonging to owners who look upon the temporary use as a source of income. Community lands or government land not used for beneficial purposes. Private non-irrigated lands where the owner is willing. Lands with an existing access road.

Figure A: Layout of Labour Camp

Setting Up of Labour Camp

The contractor shall provide free of cost in the campsite, temporary living accommodation to all the migrant workers employed by him until completion of construction/maintenance work is in progress. Estimated number of labours at one Labour camp is 150 persons (50 Skilled & 100 unskilled Labours)where more than 90% unskilled labours will be local labours the proposed sketch of labour camp is mentioned above.

The Contractor agency will setup their camping locations at different places as would be identified.

Each labour camp may house 20-30 skilled migrated labour.

These camps should be located away from the existing village or semi-urban households to prevent likely social conflicts.

Necessary permissions may be obtained from the respective revenue/municipal authorities.

Temporary house structures should be provided by the contractor agencies to accommodate the labour and their families, with provision of minimum infrastructure facilities, like water supply, sanitation etc.

A minimum area of 6 m^2 per person shall be provided.

The rooms of labourers shall be well lighted and ventilated.

The facilities to provide for the labour discussed below:

Drinking-Water

Towards the provision and storage of drinking water at the construction camp, the contractor shall ensure the following.

- The contractor shall provide for a continuous and sufficient supply of potable water in the camps, in earthen pots or any other suitable containers.
- If any water storage tank is provided, the bottom of the tank will be kept at least 1 m above the ground level.
- The contractor shall identify suitable community water sources for drinking. Only in the event of non-availability of other sources of potable water, the Contractor shall obtain water from an unprotected source only after the testing for its portability. Where water has to be drawn from an existing open well, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with dustproof trap door.
- Every water supply or storage shall be at a distance of not less than 15 m from any wastewater/sewage drain or another source of pollution. Water sources within 15 m proximity of toilet, drain or any source of pollution will not be used as a source of drinking water in the project.
- A pump shall be fitted to cover well used as drinking water source; the trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once a month.
- Else, a new well can be constructed and a pump will be fitted to the well for drinking water purposes of the labour at the camp.

Washing and Bathing Facilities

On every site, adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of labourers employed therein. Separate and adequate bathing shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions.

Toilets Facilities

Each labour camp should be provided with community toilets with septic tanks and soak pit arrangement or even bio-toilets could be better. Sanitary arrangements, latrines and urinals shall be provided in every workplace separately for male and female workers. The arrangements shall include:

- A latrine for every 25 labour or part thereof.
- Every latrine shall be undercover and so partitioned as to secure privacy and shall have a proper door and fastenings.
- Where workers of both sexes are employed, there shall be a display board of “For Men Only” or “For Women Only” outside each block of latrine and urinal in the language understood by the majority of the workers.

- The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times and should have a proper drainage system.
- Water shall be provided in or near the latrines and urinals in suitable containers.

Supply of Fuel

These labour forces may adopt unscrupulous methods of cutting trees and bushes for meeting their fuelwood requirement, which would destroy the adjacent green cover and affect the local ecology.The project authorities would ensure supply of free fuel to these labours through the contract agencies to prevent such unscrupulous activities.

- Arrangement may be made with the local Civil Supply Authorities for Supply of kerosene oil at a fixed quota.
- Use of LPG gas cylinders should be provided.
- The contract specification should include these fuel supplies free of cost to the labour force within the bid value of relevant contract items.

Waste Disposal

Disposal of sanitary wastes and excreta shall be into septic tanks. If bio-toilets will be used the excreta could be converted to manure.

Kitchen wastewater shall be disposed into soak pits/kitchen sump located preferably at least 15 m from any water body. Sump capacity should be at least 1.3 times the maximum volume of wastewater discharged per day. The bottom of the pit should be filled with coarse gravel and the sides shored up with board, etc. to prevent erosion and collapse of the pit. New soak pits shall be made ready as soon as the earlier one is filled.

Solid wastes generated in the kitchen shall be reused if recyclable or disposed of in landfill sites.
Provide segregated garbage bins in the camps and ensure that these are regularly emptied and disposed of hygienically as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of Project Authority.

The camping area should be periodically sprayed with Bleaching powder and other disinfectants.

Medical and First Aid Facilities

Medical facilities shall be provided to the labour at the construction camp. Visits of doctors shall be arranged twice a month wherein routine checkups would be conducted for every person in the camp including children. A separate room for medical checkups and keeping of first aid facilities should be built. The site medical room should display awareness posters on safety facilitation hygiene and HIV/AIDS/COVID-19 awareness.

- First Aid Box will be provided at every construction campsite and under the charge of a responsible person who shall always be readily available during working hours. He shall be adequately trained in administering first aid treatment. Formal arrangements shall be prescribed to carry injured persons or persons suddenly taken ill to the nearest hospital.

The first aid box shall contain the following:

- Six small-sterilized dressings.
- Three medium sizes sterilized dressings.

- Three large sizes sterilized dressings.
- Three large sterilized burns dressings.
- One (30 ml) bottle containing 2 % alcoholic solution of iodine.
- One (30 ml) bottle containing Sal volatile.
- One snakebite lancet.
- One (30g) bottle of potassium permanganate crystals.
- One pair of scissors.
- Ointment for burns.
- A bottle of suitable surgical antiseptic solution.

In case, the number of labour exceeds 50, the items in the first aid box shall be doubled. The contracting agency should arrange to carry out the following anti-malarial measures.

- Supply of mosquito nets.
- Supply of mosquito repellents to the labour.
- Periodic cleaning of the area to destroy stagnant water pockets as well as spraying of disinfectants through health workers.
- Supply of preventative medicines to all labour force-free of cost.
- Ensure imparting free treatment to the affected people through local health centres.

Provision of Shelter during Rest

The workplace shall provide four suitable sheds, two for meals and two for rest (separately for men and women). The height of the shelter shall not be less than 3 m from the floor level to the lowest part of the roof. These shall be kept clean.

2.2 Fire Fighting Arrangement

The following precautions need to be taken:

- Demarcation of area susceptible to fires with cautionary signage;
- Portable fire extinguishers and/or sand baskets shall be provided at easily accessible locations
- In the event of fire, Contractor shall educate the workers on usage of this equipment.

2.3 Interactions with Host Communities

To ensure that there is no conflict of the migrant labour with the host communities, the contractor shall issue identity cards to labour and residents of construction camps. A specified code of conduct to be implemented and awareness programe for the labours should also be conducted.

3. CONSTRUCTION STAGE

Construction camps shall be maintained free from litter and in hygienic conditions. It should be kept free from spillage of oil, grease or bitumen. Any spillage should be cleaned immediately to avoid pollution of soil, water stored or adjacent water bodies.

The following precautions need to be taken in construction camps.

- Measures to ensure that no leaching of oil and grease into water bodies or underground water takes place.
- Wastewater should not be disposed into water bodies.
- Regular collection of solid wastes should be undertaken and should be disposed of safely.

- All consumables as the first aid equipment, cleaning equipment for maintaining hygiene and sanitation should be recouped immediately.
- The debris/scrap generated during construction of campsite should be kept in a designated and barricaded area.
- The Engineer-in-charge will monitor the cleanliness of construction campsites and ensure that the sites are properly maintained throughout the contract.

4. POST CONSTRUCTION STAGE

After construction, all construction camp facilities shall be dismantled and removed from the site. The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works. Various activities to be carried out for site rehabilitation include:

- Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas.
- Soak pits, septic tanks shall be covered and effectively sealed off.
- Debris (rejected material) should be disposed of suitably.
- Ramps created should be leveled.
- Underground water tanks in a barren/non-agricultural land can be covered. However, in agricultural land, the tank shall be removed.
- If the construction campsite is on agricultural land, topsoil can be spread to aid faster rejuvenation.
- Proper documentation of rehabilitation site is necessary. This shall include the following:
- Photograph of rehabilitated site;
- Landowner consent letter for satisfaction in measures taken for rehabilitation of site; Confirmation regarding receipt of the entire financial lease amount for the use of land.
- Undertaking from contractor; and Certification from Engineer-in-charge.

In cases, where the construction campsite is located on a private landholding, the contractor would still have to restore the campsite as per this guideline. In addition, he would have to obtain a certificate for satisfaction from the landowner.

Appendix 14: Borrow Area Management Plan

INTRODUCTION

For construction materials are to be brought from borrow areas designated for the purpose. Borrow areas cause significant adverse environmental impacts if appropriate mitigation measures are not taken. The scope of this guideline includes measures that are required during project planning and design stage, preconstruction, construction stage and post-construction stage.

2. PROJECT PLANNING AND DESIGN STAGE

Design measures for reduction in the quantity of the earthwork will have to be undertaken to reduce the quantity of material extracted and consequently decrease the borrow area requirement. The DPR shall contain Guidelines for locating sites of borrow areas and borrow material specifications.

3. IDENTIFICATION OF THE BORROW AREAS

Specific locations of borrow areas will be identified by contractor. The selection and recommendations of borrow areas; will be based on environmental as well as civil engineering considerations. Location of source of supply of material for embankment or sub-grade and the procedure for excavation or transport of material shall comply with the environmental requirements of MoEFCC.

Certain precautions have to be taken to restrict unauthorized borrowing by the contractor. No borrow area shall be opened without permission of the Engineer-in-Charge. The borrowing shall not be carried out in cultivable lands, unless and until it shall be agreed upon by the Engineer-in-Charge that there is no suitable uncultivable land in the vicinity for borrowing or private landowners are willing to allow borrowing on their fields.

Borrow Area Identification:

- Identify areas having present land use as barren land, riverside land.
- Prefer areas of highland with respect to surroundings;
- Avoid locating borrow area close to any road (maintain at least 30m distance from ROW and 10 m from toe of embankment, whichever is higher);
- Should be at least 1.0 km away from inhabited areas;
- Minimum distance of about 1.0 km from ecologically sensitive area i.e. Reserve Forest, Protected Forest, Sanctuary, wetland etc.;
- Minimum distance of about 1.0 km from school, hospital and any archaeological sites;
- Having adequate approach road with minimum length of earthen road;
- Ensure that unsuitable soft rock is not prominent within the proposed depth of excavation which will render rehabilitation difficult;
- Controlled operation as per agreed/approved plan
- Prior approval of Rehabilitation Plan considering terrain, land use and local need;
- Restricting operation as agreed by landowner and approved by the engineer in charge.

4. PRE-CONSTRUCTION STAGE

The contractor shall identify the borrow area locations in consultation with the individual owners in case of private lands and the concerned department in case of government lands, after assessing

suitability of material. The suitable sites shall be selected and finalized in consultation with the Engineer-in-Charge.

Borrowing to be avoided in the following areas:

- Lands close to toe line.
- Irrigated agricultural lands (In case of necessity for borrowing from such lands, the topsoil shall be preserved in stockpiles.)
- Grazing land.
- Lands within 1km of settlements.
- Environmentally sensitive areas such as Reserve Forests, Protected Forests, Sanctuary, wetlands. In addition, a distance of 1 km should be maintained from such areas.
- Designated protected areas/forests.
- Unstable side-hills.
- Seepage areas.
- Areas supporting rare plant/ animal species;
- Ensure unsuitable soft rock is not prominent within the proposed depth of excavation, which will render rehabilitation difficult.

5. CONSTRUCTION STAGE

No borrow area shall be operated without Environment Clearance & Environment Clearance condition. In addition, the contractor should adopt precautionary measures to minimize any adverse impacts on the environment. Checklists for monitoring borrow areas' operation and management have been prepared (**Table A**).

Table No. A: Checklist for Monitoring Borrow Area Operation and Management

Attributes	Requirements
Access Road	Access road shall be used for hauling only after approval.
Topsoil preservation	Topsoil, shall be strip and stored at corners of the area before the start of excavation for material collection. Topsoil should be reused/re-laid as per agreed plan; In case of riverside, borrow pit should be located not less than 10 m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood.
Depth of excavation	For agricultural land, the total depth of excavation should be limited to 150 cm including top 30 cm for topsoil preservation; For riverside borrow area, the depth of excavation shall be regulated so that the inner edge of any borrow pit, should not be less than 15 m from the toe of the bank. To avoid any embankment slippage, the borrow areas will not be dug continuously and the size and shape of borrow pits will be decided by the Engineer-in-Charge.
Damage to surrounding land	Movement of man and machinery should be regulated to avoid damage to surrounding land. To prevent damages to adjacent properties, the Contractor shall ensure that an undisturbed buffer zone exists between the distributed borrow areas and adjacent land. Buffer zone shall be 3 m wide or equal to the depth of excavation whichever is greater.
Drainage control	The Contractor shall maintain erosion and drainage control near all borrow pits and make sure that surface drains do not affect the adjacent land or future reclamation. This needs to be recheck by the Engineer-in-Charge.
Dust Suppression	Water should be sprayed on kutcha haul road twice a day or as may be required to avoid dust generation during transportation of material; Depending on moisture content, 0.5 to 1.5% water may be added to excavated soil before loading during dry weather to avoid fugitive dust

Attributes	Requirements
	emission.
Covering material for transport material	Material transport shall be provided with tarpaulin cover.
Personal Protective Equipment	Workers should be provided with helmets, gumboots and air masks and their use should be strictly enforced.
Redevelopment	The area should be redeveloped within agreed timeframe on completion of material collection as per agreed rehabilitation plan.

6. POST CONSTRUCTION STAGE

All reclamation is to obtain within one month of abandonment of borrow area, in accordance with the redevelopment plan. The site shall be inspected by the Engineer-in-Charge after implementation of the reclamation plan. Certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that "the land is restored to his satisfaction". Engineer shall make the final payment after the verification in charge.

7. OPERATION

No borrow area will be operational without written consent of the landowner. To avoid any embankment slippage, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer-in-Charge. The contractor shall evolve site-specific redevelopment plans for each borrows area location, which shall be implemented after the approval of the Supervision /Independent Consultant.

Precautionary measures as the covering of vehicles will be taken to avoid spillage during transport of borrow materials. To ensure that the spills, which might result from the transport of, borrow materials do not affect the settlements, it will be ensured that the excavation and carrying of earth will be done during daytime only. The unpaved surfaces used for the haulage of borrow materials will be maintained properly. A general guideline will be followed in the line of MoEF&CC conditions as follows:

- The borrowing/excavation activity shall be restricted to a maximum depth of 2 m below general ground level at the site.
- The borrowing/excavation activity shall be restricted to 2 m above the groundwater table at the site.
- The borrowing/excavation activity shall not alter the natural drainage pattern of the area.
- Appropriate fencing will be provided all around the borrowed/excavated pit made to prevent any mishap.
- Measures shall be taken to prevent dust emission by covering borrowed/excavated earth during transportation.
- Safeguards shall be adopted against health risks because of breeding of vectors in the water bodies created due to borrowing/excavation of earth.
- Workers/labour shall be provided with Personal Protective Equipment (PPE). The use of Personal Protective Equipment (PPE) at all times during works will be ensured.
- A berm shall be left from the boundary of adjoining field having a width equal to at least half the depth of proposed excavation.
- A minimum distance of 15 m from any civil structure shall be kept from the periphery of any excavation area.

Borrowing of earth shall be carried out at locations recommended as follows:

- **Non- Cultivable Lands:** Borrowing of earth will be carried out up to a depth of 2.0 m from the existing ground level. Borrowing of earth shall not be done continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges, if necessary, to facilitate drainage. Borrow pits shall have slopes not steeper than 1 vertical in 4 horizontals.
- **Productive Lands**: Borrowing of earth shall be avoided on productive lands. However, in the event of borrowing from productive lands, under circumstances as described above, topsoil shall be preserved in stockpiles. At such locations, the depth of borrow pits shall not exceed 45 cm and it may be dug out to a depth of not more than 30 cm after stripping the 15 cm topsoil aside.
- **Elevated Lands:** At locations where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 2m or up to the level of surrounding fields.
- **Borrow pits along Roadside:** Borrow pits shall be located 10 m away from the toe of the embankment. Depth of the pit should be such that the bottom of the pit shall not fall within an imaginary line of slope one vertical to four horizontals projected from the edge of the final section of the bank. Borrow pits should not be dug continuously. Ridges of not less than 8 m widths should be left at intervals not exceeding 300 m. Small drains should be cut through the ridges to facilitate drainage.
- **Borrow pits on the riverside:** The borrow pit should be located not less than 10 m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood.
- **Community/ Private Ponds:** Borrowing will be carried out at locations, where the private owners (or in some cases, the community) desire to develop lands (mostly low-lying areas) for pisciculture purposes and use as fishponds.
- **Borrow Area near Settlements:** Borrow pit location shall be located at least 0.8 km from village and settlements. If unavoidable, they should not be dug for more than 30 cm and should be drained.

8. BORROW AREA REDEVELOPMENT

Each borrow area should be rehabilitated immediately after completion of extraction of materials to the satisfaction of the landowner and the Engineer-in-Charge. The borrow area shall be redeveloped appropriately as per approved plan and landowner's requirement. The borrow pits may be developed into ponds after levelling the bottom and slope maintenance. The borrow pits may be refilled with earth materials covered with fertile soil. The upland used as borrow area shall be levelled matching with the level of surrounding area. No scare created due to borrowing of earth should be left unattended. The Contractor should provide completion certificate of redevelopment of each borrow pit issued by the landowner.

9. CHECKLIST FOR INSPECTION OF REHABILITATION AREA

Inspection needs to be carried out by the Engineer in charge of overseeing the redevelopment of borrow areas as per the plan. The checklist for the inspection by the Engineer in charge is given below.

- Compliance of post-borrowing activities and land use with the restoration plan;
- Drainage measures taken for inflow and outflow in case borrow pit is developed as a detention pond;
- Leveling the bottom of the borrow areas;

- In case the borrow area is on private property, the contractor shall procure written letter from Landowner for satisfaction on rehabilitation. In case of no rehabilitation is desired by the landowner, the letter should include statement "no responsibility of contractor in the event of accident".
- Condition of the reclaimed area in comparison with the pre-borrowing conditions.

10. STATUTORY CLEARANCE FOR BORROW AREA:

Regarding the borrow area for ordinary soil, the Contractor has to obtain environmental clearance from State Environmental Impact Assessment Authority (SEIAA) or District Environmental Impact Assessment Authority (DEIAA) of MoEF&CC vide their notification no. S.O. 141(E) dated 15th January 2016. If the area of a borrow area is less than 5 ha, then this will be treated as Category-B-2 Project and will be appraised and approved based on only Form-1. No EIA study will be required for such area. However, if the size of the borrow area is more than 5 ha then it will be categorized as "Category-B1" and therefore will require EIA study, based on which the SEIAA will give clearance for the same.

11. PROCEDURE FOR ENVIRONMENTAL CLEARANCE FOR MINING OF MINOR MINERALS INCLUDING CLUSTER:

The following policy shall be followed for environmental clearance of mining of minor minerals including cluster situation:

a) The data provided by the States (Sustainable Sand Mining Guidelines) shows that most of the mining leases for minor minerals be of lease area less than 5 hectares. It is also reported that in hill States getting a stretch in river with area of more than 5 hectares is very uncommon. Therefore, the States as per their circumstances will determine the size of lease for minor minerals including river sand mining.
b) The mining of minor minerals is mostly in clusters. The Environment Impact Assessment or Environment Management Plan is required to be prepared for the entire cluster in order to capture all the possible externalities. These reports shall capture carrying capacity of the cluster, transportation and related issues, replenishment and recharge issues, geohydrological study of the cluster area. The Environment Impact Assessment or Environment Management Plan shall be prepared by the State or State nominated Agency or group of project proponents in the Cluster or the project proponent in the cluster.
c) Environmental clearance shall be applied for and issued to the individual project proponent. The individual leaseholders in cluster can use the same Environment Impact Assessment or Environment Management Plan for application for environmental clearance. The cluster Environment Impact Assessment or Environment Management Plan shall be updated as per need keeping in view any significant change.
d) The details of cluster Environment Impact Assessment or Environment Management Plan shall be reflected in each environmental clearance in that cluster and DEAC, SEAC, and EAC shall ensure that the mitigating measures emanating from the Environment Impact Assessment or Environment Management Plan study are fully reflected as environmental clearance conditions in the environmental clearances of individual project proponents in that cluster.
e) A cluster shall be formed when the distance between the peripheries of one lease is less than 500 meters from the periphery of other leases in a homogeneous mineral area.
f) Form-1M, Pre-Feasibility Report and mine plan for Category 'B2' projects for the Registered Qualified Person or Accredited Consultants of Quality Council of India; National Accreditation Board shall prepare to mine of minor minerals for Education and Training. The Environment Impact Assessment or Environment Management Plan for Category 'A' and Category 'B1' projects

shall be prepared by the accredited consultants of Quality Council of India, National Accreditation Board for Education and Training.

g) The SEIAA shall have supervise and review without prejudice to any provisions under any existing law.

Appendix 15: OHS Management Plan

The purpose of the Occupational Health and Safety (OHS) Management Plan is to provide guidance for the implementation of Safety and Health Management in the Project. The OHS Plan is to assist AEGCL/contractor in establishing, implementing and integrating OHS control, monitoring and mitigation measures for the project.

Guidance to Occupational Health, Safety and Environmental Policy (EMF)

This framework is to assist the implementation officers in identification, assessment, monitoring, evaluation and compliance to the Occupational Health, Safety and Environmental aspects generally associated with various components of the Programme. It suggests practical ways to integrate sustainability management into the internal operations of I-3 Programme.

Based on the different Programme components, the relevant EMF parameters can be considered by the implementing officers from this document.

Environment, Occupational Health and Safety Management Framework (EMF) outlines the essentials for the Programme components and the specific management parameters

Environmental, Safety and Health aspects under the Programme specifies the issues Identified under the Programme through site visits to representative locations relevant to the programme components through corresponding feedbacks and evaluation. The Management Framework accordingly provides for the mitigation measures to be included for the programme components based on the identified issues.

Training Plan provides for the definite means to build the Environmental management capacity through tailor made training modules structures as a part of the broader Programme Training Component followed by applicable budget specifications under I-3Programme Description.

EMF integration into I-3 Programme

- Protect the environment and to continual improvement in the management of Programme activities;
- Ensure better compliance with applicable regulations, and reducing adverse impacts on people and the environment from the Programme operations;
- Promote adoption of Good Industry Practices (GIP), Good Laboratory Practices (GLP) and best practices in I-3 Programme activities;
- Integrate economic and environmental considerations in the decision-making process;
- Capacity Building of the Biotechnology stakeholders towards sustainability consciousness;
- Exercising monitoring as a quality control tool for determining whether study activities are being carried out as planned, so that deficiencies can be identified and corrected; and
- Pursue environmental goals in a cost-effective manner and to preserve culture of sustainability.

SCOPE

The HSE Plan reflects priority upon the Occupational Health and Safety at workplaces.

- Ensure the Health and Safety of all persons at work site is not adversely affected by the work.

- Ensure protection of environment of the work site.
- Comply at all times with the relevant statutory and contractual HSE requirements.
- Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- Provide all personnel with adequate information, instruction, training and supervision on the safety aspect of their work.
- Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- Establish effective communication on HSE matters with all relevant parties involved in the Project works.
- Ensure that all work planning takes into account all persons that may be affected by the work.
- Ensure fitness testing of all T&Ps/Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent person.
- Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
- Ensure continual improvements in HSE performance
- Ensure conservation of resources and reduction of wastage.
- Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause.
- Ensure timely implementation of correction, corrective action and preventive action.

DESCRIPTION OF PROJECT

MANAGEMENT COMMITMENT

Health & Safety Policy

Health, Safety and Environment (HSE) responsibilities are driven by commitment to protect employees and people we work with, community and environment.

We are committed to:

- Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- Ensuring compliance with applicable legislation, regulations and AEGCL systems.
- Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination/ substitution/reduction/control.
- Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.
- Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, contractors and suppliers on HSE issues.
- Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.

Lockout/Tagout and LOTO Safety

The LOTO standard establishes the employer's responsibility to protect workers from hazardous energy. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures.

- Proper lockout/tagout (LOTO) practices and procedures safeguard workers from the release of hazardous energy. The OSHA standard for The Control of Hazardous Energy (Lockout/Tagout) (29 CFR 1910.147) for general industry, outlines specific action and procedures for addressing and controlling hazardous energy during servicing and maintenance of machines and equipment. Employers are also required to train each worker to ensure that they know, understand, and are able to follow the applicable provisions of the hazardous energy control procedures. Workers must be trained in the purpose and function of the energy control program and have the knowledge and skills required for the safe application, usage and removal of the energy control devices.
- All employees who work in an area where energy control procedure(s) are utilized need to be instructed in the purpose and use of the energy control procedure(s), especially prohibition against attempting to restart or reenergize machines or other equipment that are locked or tagged out.
- All employees who are authorized to lockout machines or equipment and perform the service and maintenance operations need to be trained in recognition of applicable hazardous energy sources in the workplace, the type and magnitude of energy found in the workplace, and the means and methods of isolating and/or controlling the energy.
- Specific procedures and limitations relating to tagout systems where they are allowed.
- Retraining of all employees to maintain proficiency or introduce new or changed control methods.

RESPONSIBILITIES

SITE IN -CHARGE OF SUBCONTRACTOR

- Shall sign Memorandum of Understanding (MoU) for compliance to AEGCL's HSE Plan for Site Operations
    - Shall engage qualified safety officer(s) and steward (s)
    - Shall adhere to the rules and regulations mentioned in this code, practice very strictly in his area of work in consultation with his concerned engineer and the safety coordinator
    - Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required
    - Shall not engage any employee below 18 years
    - Shall arrange for all necessary PPEs like safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job. Shall ensure that no working men/women carry excessive weight more than stipulated in Factory Rule Regulation
    - Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent person
    - Shall ensure that provisions stipulated in contract Labour Regulation Act 1970, Chapter V C.9, canteen, rest rooms/washing facilities to contracted employees at site
    - Shall adhere to the instructions laid down in Operation Control Procedures (OCPs) available with the site management.

- Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure
- Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of AEGCL.
- Shall ensure that Horseplay is strictly forbidden
- Shall ensure that adequate illumination is arranged during night work
- Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
- Shall ensure display of adequate signage/posters on HSE.
- Shall ensure that mobile phone is not used by workers while working.
- Shall ensure conductance of HSE audit, mockdrill, medical camps, induction training and training on HSE at site.
- Shall ensure full co-operation during HQ/External /Customer HSEaudits.

- Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule
  - Shall ensure good housekeeping
  - Shall ensure adequate valid fire extinguishers are provided at the worksite
  - Shall ensure availability of sufficient number of toilets /restrooms and adequate drinking water at work site and labour colony
  - Shall ensure adequate emergency preparedness
  - Shall be member of site HSE committee and attend all meetings of the committee
  - Power source for hand lamps shall be maximum of 24 v
- Temporary fencing should be done for open edges if Hand – railings and Toe-guards are not available

HEALTH AND SAFETY OFFICER OF SUBCONTRACTOR

- Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
- Facilitate inclusion of safety elements into Work Method Statement
- Highlight the requirements of safety through Tool-box / other meetings.
- Help concerned HOS to prepare Job Specific instructions for critical jobs
- Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures
- Advice & co-ordinate for implementation of HSE permit systems, OCPs & MPs.
- Convene HSE meeting & minute the proceeding for circulation & follow-upaction
- Plan procurement of PPE & Safety devices and inspect their healthiness
- Report to PS Region/HQ on all matters pertaining to status of safety and promotional program at site level
- Facilitate administration of First Aid
- Facilitate screening of workmen and safety induction
- Conduct fire Drill and facilitate emergency preparedness
- Design campaigns, competitions & other special emphasis programs to promote safety in the workplace
- Notify site personnel non-conformance to safety norms observed during site visits / site inspections
- Recommend to Site In charge, immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or propertyor environment

- To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.
- Encourage raising Near Miss Report on safety along with, improvement initiatives on safety
- Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters

PROVISION OF PPEs

Personnel Protective Equipment (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured

The following matrix recommends usage of minimum PPEs against the respective job.

Sr. No	Type of work	PPEs
1	Concrete and asphalt mixing	Nose mask, hand glove, apron and gum boot
2	Welders/Grinders/ Gas cutters	Welding/face screen, apron, hand gloves, nose mask and ear muffs if noise level exceeds 90dB. Helmet fitted with welding shield is preferred for welders
3	Stone/ concrete breakers	Ear muffs, safety goggles, hand gloves
4	Electrical Work	Rubber hand glove, Electrical Resistance shoes
5	Insulation Work	Respiratory mask, Hand gloves, safety goggles
6	Work at height	Double lanyard full body harness, Fall arrestor (specific cases)
7	Grit/Sand blasting	Blast suit, blast helmet, respirator, leather gloves
8	Painting	Plastic gloves, Respirators (particularly for spray painting)
9	Radiography	As per BARC guidelines

The PPEs shall conform to the relevant standards as below and bear ISI mark.

Relevant is-codes for personal protection

IS: 2925 – 1984	Industrial Safety Helmets.
IS: 4770 – 1968	Rubber gloves for electrical purposes.
IS: 6994 – 1973 (Part-I)	Industrial Safety Gloves (Leather &Cotton Gloves).
IS: 1989 – 1986 (Part-I-II)	Leather safety boots and shoes.
IS: 5557 – 1969	Industrial and Safety rubber knee boots.
IS: 6519 – 1971	Code of practice for selections care and repair of Safety footwear.
IS: 11226 – 1985	Leather Safety footwear having direct molding sole.
IS: 5983 – 1978	Eye protectors.
IS: 9167 – 1979	Ear protectors.
IS: 1179-1967	Eye & Face protection during welding
IS: 3521 – 1983	Industrial Safety Belts and Harness
IS:8519 -1977	Guide for selection of industrial Safety equipment for body protection
IS:9473-2002,14166- 1994,14746-1999	Respiratory Protective Devices

The list is not exhaustive. The safety officer may demand additional PPEs based on specific requirement.

ARRANGEMENT OF INFRASTRUCTURE

DRINKING WATER

- Drinking water shall be provided and maintained at suitable places at different elevations.
- Container should be labeled as " Drinking Water"
- Cleaning of the storage tank shall be ensured atleast once in 3 months indicating date of cleaning and next due date.
- Potability of water should be tested as per IS10500 at least once in a year.

WASHING FACILITIES

- In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
- Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition and dully illuminated for night use.
- Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.

LATRINES AND URINALS

- Latrines and urinals shall be provided in every work place.
- Urinals shall also be provided at different elevations.
- They shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times, by appointing designated person.
- Separate facilities shall be provided for the use of male and female worker if any.

PROVISION OF SHELTER DURING REST

Proper Shed & Shelter shall be provided for rest during break

MEDICAL FACILITIES

- A medical centre shall be ensured/identified at site with basic facilities for handling medical emergencies. The medical center can be jointly developed on proportionate sharing basis with permission from AEGCL
- A qualified medical professional, not less than MBBS, shall be deployed at the medical centre
- The medical centre shall be equipped with one ambulance, with trained driver and oxygen cylinder.
- Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste – Management and Handling Rules, 1998)

PROVISION OF EMERGENCY VEHICLE

Dedicated emergency vehicle shall be made available at workplace by each subcontractor to handle any emergency

TRAINING ON HEIGHT WORK

Training on height work shall be imparted to all workers working at height by in-house/external faculty at least twice in a year. The training shall include following topics:

- Use of PPEs
- Use of fall arrester, retractable fall arrester, life line, safety nets etc.
- Safe climbing through monkey ladders.
- Inspection of PPEs.
- Medical fitness requirements.
- Mock drill on rescue at height.
- Dos & Don'ts during height work.

HSE TRAINING DURING PROJECT EXECUTION

- Other HSE training shall be arranged by AEGCL/ subcontractor as per the need of the project execution and recommendation of HSE committee of site.
- The topics of the HSE training shall be as follows but not limited to:
    - Hazards identification and risk analysis (HIRA)
    - Work Permit System
    - Incident investigation and reporting
    - Fire fighting
    - First aid
    - Fire-warden training
    - EMS and OHSMS
    - T & Ps fitness and operation
    - Electrical safety
    - Welding, NDE & Radiological safety
    - Storage, preservation & material handling.

HSE ACTIVITIES

HSE activities shall be conducted at site based on the HSEMSM developed by Power Sector and issued to site by Regions.
While planning for any activity the following documents shall be referred for infrastructural requirements to establish control measures:
1) HSE Procedure for Register of OHS Hazards and Risks
2) HSE Procedure for Register of Environmental Aspects and Impacts
3) HSE Procedure for Register of Regulations
4) Operational Control Procedures
5) HSE Procedure for Emergency Preparedness and Response Plan
6) Contract documents

SAFETY DURING WORK EXECUTION

Respective OCPS are to be followed and adherence to the same would be contractually binding

ELECTRICAL SAFETY

- Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.

- Fulfilling safety requirements at all power tapping points.
- High/ Low pressure welders to be identified with separate colour clothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
- The subcontractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
- All portable electric tools used by the subcontractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works.
- The subcontractor shall use only properly insulated and armored cables which conform to the requirement of Indian
- Electricity Act and Rules for all wiring, electrical applications at site.
- AEGCL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the subcontractor.
- All electrical appliances used in the work shall be in good working condition and shall be properly earthed.
- No maintenance work shall be carried out on live equipment.
- The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
- Area wise Electrical safety inspection is to be carried out on monthly basis as per "Electrical Safety Inspection checklist' and the report is to be submitted to AEGCL safety officer
- Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public
- The subcontractor shall carefully follow the safety requirement of AEGCL / the purchaser with the regard to voltages used in critical areas.

WORKING PLATFORM

Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above. Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.

LADDER SAFETY

Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app.
29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least ¼'' for each
additional foot of length.

A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.

LIFTING SAFETY

- It will be the responsibility of the subcontractor to ensure safe lifting of the equipment, taking due precaution to avoid any incident and damage to other equipment and personnel.
- All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the subcontractor by engaging only the Competent Persons as per law.
- Defective equipment or uncertified shall be removed from service.
- Any equipment shall not be loaded in excess of its recommended safe working loa

Appendix 16: Emergency Action Plan

Introduction

This EAP presents the Transmission Line Construction Emergency Response Plan (the Plan) for the Phase II of the AISTSEP project includes construction of new 14 nos of 220 kV and 132 kV GIS and AIS substations, as well as the associated transmission lines. This Plan is intended to provide information and instruction to AEGCL, and guidance for contractors to follow when developing plans for their specific work. Contractors selected to undertake the work will submit their emergency response plans to AEGCL for review and approval, in keeping with the guidance of this document, and must include additional detail and direction to further supplement this Plan. The Plan outlines how AEGCL and its contractors will respond in the event of an emergency during the construction phase of the AISTSEP Project.

Purpose

The purpose of this document is to outline requirements to be implemented by all contractors hired to construct the transmission lines. These requirements are not all-inclusive and are provided to set a minimum level of adherence for the contractor(s).

Contractor responsibilities

The successful contractor(s) is responsible for developing specific emergency response plans and administering an emergency response system which covers all work to be performed onsite. The emergency response plans will include:

a) a response plan for spills of fuels and fluids associated with construction
b) a response plan for medical incidents that includes provision for 24-hour emergency transport to hospital
c) a plan for fire response and evacuation
d) a security plan; and
e) an emergency contact list and emergency notification plan for government and response agencies and communities to the right-of-way and/or impacted work sites

The contractor must at all times take all precautions appropriate to maintain the health and safety of the contractors' personnel and all others on site. The contractor is responsible for the adequacy, stability and safety of all site operations and construction methods and must comply with workplace safety and health laws. The contractor must comply with all applicable laws and Regulations respecting workplace safety, wherever work is performed.

Project description

In Phase II of the AISTSE project, the focus is on expanding the state's electricity transmission capacity through the construction of new power sub-stations, associated transmission lines, and complementary infrastructure. The overarching goal is to enhance energy access for industries and businesses while concurrently minimizing transmission losses. The project aims to address the growing demand for electricity, fostering economic development and sustainability. The specific sub-projects detailed in this chapter will provide a comprehensive overview of the proposed construction activities, specifying the locations for new power sub-stations, the routes for associated transmission lines, and the related infrastructure improvements. An integral part of the initiative is the meticulous

implementation schedule, ensuring timely and efficient completion of each component. Through these, Phase II endeavours to contribute significantly to the state's energy infrastructure, promoting resilience, reliability, and equitable access to power resources.

Emergency response plans

Emergency response plan requirements

The Contractor must submit an emergency response plan (ERP) as part of their safety management plan to Manitoba Hydro for review and approval. This Plan must include the following items without limitation:

a) Detailed emergency response information for all areas of the Project Including Project site, storage areas, site office and camps where required
b) Sufficient measures to remove all personnel in the event of an emergency
c) List of medical facilities
d) Transportation methods
e) Site access points

Spill response plan

The contractors are required to develop a Spill Response Plan and submit to AEGCL for approval prior to the commencement of construction activities. The Spill Response Plan must include sufficient detail and response procedures so environmental emergencies are addressed in a safe and timely manner to minimize the impact on the surrounding environment.

All contractor employees on the project must be trained and aware of their responsibilities in the prevention of spill and in the event of a spill.

All spills and/or releases to the environment must be reported to the required level of authorities within the timeframes specific to those reporting requirements.

First aid, emergency response and rescue

First aid

The contractor must ensure that required number of employees are trained in the required level of First Aid for each work location to meet the requirements of the Safety and Health Act and Regulations. The contractor must maintain an up to date list of First Aid training and ensure all trained employees and first aid kits are identified at all work locations.

Emergency response

The contractor must have in place a process to identify existing and potential dangers to contractor's personnel at site and the measures that will be taken to reduce, eliminate or control those dangers, including procedures to be followed in an emergency.
The contractor must have in place a process to identify internal and external resources that may be required to respond to an emergency at site.

The contractor will develop an Emergency Response Plan for all physical areas of its performance of the work at site as well as its site office and storage areas. As part of the plan, the contractor must

include plans outlining how it will communicate to remove its work force from the site if an emergency event requires the removal of the contractor's work force from the site.

The contactor Emergency Response Plan must also include; a communication process, a list of medical facilities, transportation method, site access points and muster point locations. The contractor must test its Emergency Response Plans prior to commencing the work and at a minimum annually throughout the performance of the work. All persons working or visiting the project site must receive a copy and orientation of the contractor Emergency Response Plan before entering any project site locations.

Rescue

The contractor must include rescue plans for all areas of work in the Emergency Response Plan. Rescue plans must include training requirements, procedures and Rescue equipment locations. Rescue equipment must meet the requirements of Workplace Safety and Health Act and Regulations and be on site and readily available.

Fire Response and evacuation plan

The contractor must take all necessary steps to prevent and extinguish all fires, and promptly report the occurrence of all fires to AEGCL. The contractors are required to develop an evacuation plan for emergencies included in the emergency response plans.

The contractor is responsible for providing suitable fire control equipment for the protection of equipment, the portions of the work being constructed or installed and the materials. All fire protection equipment required by legislation and relevant work permits will be kept on site and maintained in serviceable condition. The contractor must properly train their personnel to operate the fire suppression systems provided.

Burning of materials is not permitted without a burn permit from the concerned authority. In order to mitigate the risk of fire on the project site.

Site security

The contractors are required to develop site security measures to protect the public from the hazards present on the project. The contractors will be required to barricade work areas which contain hazards to the public, post the required signage to inform the public of the hazards present, maintain good housekeeping and provide overnight security as required.

Responsibilities, compliance and communication

Roles and responsibilities

Prime contractors must at all times take all precautions appropriate to maintain the health and safety of the contractors' personnel and all others on site. The contractor is responsible for the adequacy, stability and safety of all site operations and construction methods and must comply with workplace safety and health laws.

Before commencing the work, the contractor must identify its dedicated on site safety supervisor, who must attend a pre-job meeting at AEGCL's office to review safety matters for the work and be approved by the AEGCL's safety representative. This person must have no other duties assigned. The

dedicated on site safety supervisor is responsible for, but not limited to, the identification and control of potential safety hazards at the work sites.

Ensuring compliance

This Plan will be incorporated into the Project-specific construction environmental protection plan. Furthermore, the contractor must prepare and submit to AEGCL weekly progress reports that include safety information and statistics as well as environmental information and statistics including information on spills. The weekly health and safety performance report must include safety information and statistics for the contractor's site activities, including, but not limited to, First Aid cases; medical treatment cases; and fire incident reports.

Responsibilities for Notification

Assistant General Manager- In-charge is responsible for inspection in a potential emergency such as the potential threat of high waters or a tropical cyclone. He will contact the District Magistrate/Collector, Local Police, affected Gram Panchayats, and other administrational Officials.

If warranted, Assistant General Manager- In-charge will notify the State and District Disaster Management Authorities as per emergency situation and respective Notification Flowchart.

District Administration or Local Police will notify downstream residents.

Emergency Operation Centre

In the event of a failure condition, AEGCL / Contractor activate the Emergency Operation Centre to serve as the main distribution centre for warning and Evacuation activities with Head Safety.

The Emergency Operations Centre will be responsible for initiating actions from this location in coordination with Emergency/ Disaster Management Team.

Emergency Detection

Situations

Many conditions can lead to emergency situations, not all of which will necessitate the Implementation of the EAP. However, if any of them occur, the appropriate actions must be taken.

Severe Storms/Inclement Weather: Although generally not in themselves a threat to the dam, severe storms and other inclement weather conditions can contribute to an existing problem and hinder any remediation efforts. Severe storms also cause the uncontrolled release of floodwater, and increase flow in already rain-swollen areas.

Tropical cyclones: Tropical cyclones do occur in the area, with the potential for structural damage, possibly resulting in its failure. If a tropical cyclone has struck in the area, an inspection of the site for any signs of damage will be appropriate.

Earthquakes: An earthquake is a possibility, and appropriate post-earthquake inspections should be performed.

PREPAREDNESS

Preparedness actions are to be taken both before and following the development of emergency conditions and should identify ways of preparing for an emergency, increasing response readiness in a uniform and coordinated manner, and helping to reduce the effects of a dam failure.

The following are some steps that could prevent or delay failure after an emergency is first discovered.

Surveillance: Assistant General Manager- In-charge will monitor the site during emergency situations such as a severe storm event.

Response during periods of darkness and adverse weather: Assistant General Manager- Incharge will arrange for access to generators and lights to adequately monitor the situation. Assistant General Manager- In-charge will be able to access the site during adverse weather conditions on foot.

Access to the site: Alternate access routes should be planned in the event of an emergency at the site.

Preventive measures can be taken in an emergency to prevent failure of the site, but such repairs should be undertaken with extreme caution. The repairs are only temporary, and a permanent repair should be designed by an engineer as soon as possible.

Appendix 17: Gender Action Plan

OBJECTIVES OF THE GAP

The Gender Action Plan (GAP) illustrates the specific activities to address gender specific concerns and social impacts associated with the proposed project (wherever applicable).

The objectives of the GAP are follows:

- Promote women's participation in project
- Maximize women's access to project benefits
- Minimize social vulnerability of women arising due to the project activities like securing land, security concerns during construction

MEASURES TO ADDRESS GENDER ISSUES AND ACTION PLAN

The specific actions that have to be undertaken during the planning phase and the recommended actions during construction and operations phase to ensure gender-based benefits of the proposed project. In general, the gender action plan underscores the importance of participation of women in the project area in a free, prior and informed manner across various activities of engagement.

The Gender Action Plan will be effective across the entire project area under AISTSEP Phase II. The project will implement gender actions as mentioned that will ensure involvement of women in project activities and maximize project benefits and try to mitigate the potential adverse impacts, especially on women.

Table 1 : Gender Issues and action plan (wherever applicable)

Issues	Measures	Applicability	Responsible Agency	Monitoring Indicators
A. Women Working in Energy Sector and Construction Site				
Women workforce	Encourage contractors to prioritize the use of local materials and the employment of local workers and to maximize use of women (at least 30%) in labour-based work (wherever feasible)	Construction phase	Initiative to be taken by thedevelopers and ensure policy alignment with the contractors hired	Minimum 30% of the workforce are women at the construction site
Equal wage	Ensure equal pay for equal work for women and men for all construction and maintenance work. Also, to be included in contractors' agreement	Construction phase	AEGCL and Contractors	All workers (both women and men doing same work) receive same wage and reflected in payroll
Employment announcement	Announce employment opportunities and recruitment notices widely, targeted at women as well as men.	Pre-construction phase	To be implemented by the contractor	Notice of employment opportunity published in local newspapers, cable channels, ward offices, housing society offices, outside the construction site, etc.
Employment	Technical training can be	Operational	AEGCL can take	Can target minimum

Issues	Measures	Applicability	Responsible Agency	Monitoring Indicators
Opportunities	provided to the local workforce, especially women for inclusion in operation and maintenance phase	phase	the initiative and implement it	25 % women
Availability of basic facilities	Ensure basic facilities (separate toilets, clean water, drinking water facilities, resting place, crèche) are provided for female as well as male workers at the construction site	Construction and Operational phase	To be implemented by the contractors and to be ensured by AEGCL	All facilities available at the construction site and used by the women workers
B. Women Residing in Adjacent Settlements of Project Area				
Livelihood	Preference may be given to women from project affected families to work as unskilled workers (wherever feasible) during the construction phase and they receive equal wage for the work	Construction phase	Contractor and AEGCL	Minimum 30 % of the workforce is women
Women in energy decision making	Women to be trained and empowered to be part of household energy solutions – their understanding and knowledge about their own household energy needs to be translated in defining the way forward on access to clean, affordable and sustainable energy.	Through the project lifecycle	AEGCL to facilitate trainings with help of any local NGO working on sustainable renewable energy	Minimum 50 % women receive training and are empowered as energy decision makers in the project area
Safety and Security concerns	Provision of proper labour camp at construction site to reduce interphase of construction labours with community people. Minimize and avoid any obstruction related to access roads	Construction phase	Contractor	Number of safety and security related complaints registered with GRC
Issues	Measures	Applicability	Responsible Agency	Monitoring Indicators
Land for Sub-stations & Transmission Lines	Proper compensation for land to be acquired for sub-stations and transmission tower footings Efforts may be made to avoid acquiring lands from women headed families; where avoidance is not possible special assistance may be provided to the affected family	Pre-construction phase	AEGCL and Agency implementing Resettlement Plan (RP)	

Annexure 18: Public Consultation Photographs







Appendix 19: AIIB Project Affected Peoples Mechanism (PPM)

Project-affected people may raise their concerns regarding the environmental and social aspects of an AIIB-financed Project with the Client and AIIB during the preparation and implementation of the Project.

The Project-affected People's Mechanism (PPM) was established by AIIB to provide an opportunity for an independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by AIIB's failure to implement its Environmental and Social Policy (ESP) when their concerns cannot be addressed satisfactorily through Project-level grievance redress mechanisms or AIIB Management's processes. The PPM entered into effect on March 31, 2019. The PPM is guided by the Policy on the PPM (PPM Policy) and Rules of Procedure of the PPM (PPM Rules of Procedure).

The Complaints-resolution, Evaluation and Integrity Unit (CEIU) is responsible for the functioning of the PPM. Further details on the CEIU are set out in the FAQ question "How are we Organized?" and the PPM Rules of Procedure 1.

The PPM's three submission-handling functions are summarized below:

Project Processing Queries

A Project Processing Query (PPQ) is designed to enable Project-affected people to obtain rapid resolution of their concerns about simple matters that arise during AIIB's environmental and social due diligence of a Project and do not require dispute resolution (see below). The due diligence includes screening, categorization and assessment of the environmental or social impacts of the Project. Examples of concerns that may be suitable for a PPQ include inquiries about the consultation process related to a Project or requests to address environmental nuisances such as dust, noise or mobility restrictions experienced during Project preparation. For further details on when a PPQ may be appropriate and how the process is conducted, please see Sections 3 through 6 (especially 6.5) of the PPM Rules of Procedure.

Requests for Dispute Resolution:

Requests for Dispute Resolution (RDR) allow the PPM to seek to facilitate and coordinate the resolution of a dispute that has arisen over measures required to mitigate known and quantifiable, potential or actual material adverse environment and social impacts that arise during AIIB's due diligence of a Project or during Project implementation. The parties to the dispute typically include the Client and the Requestors, but they may also involve Management and/or contractors or other parties involved in the Project processing or implementation. The aim of this process is to reach a time-bound and monitorable dispute resolution agreement between the parties concerned on actions to mitigate these impacts. Under this process, the PPM explores with the concerned parties mutually acceptable dispute resolution methods. This process may include consultative dialogue, information sharing, joint-fact finding, creation of a mediation mechanism or other methods. For further details on when an RDR may be appropriate and how the process is conducted, please see Sections 3 through 6 (especially 6.6) of the PPM Rules of Procedure.

Requests for Compliance Review:

The process under a Request for Compliance Review (RCR) involves an investigation by the PPM of allegations by Project-affected people that AIIB has failed to comply with its obligations under the ESP in its environmental and social due diligence of a Project during Project preparation or its oversight of the Project during implementation, thereby causing or being likely to cause material adverse environmental or social impacts on the Project-affected people. If the allegations are substantiated, the process includes a review of any action plan proposed by Management to address these impacts.

Unlike the PPQ and RDR processes, an RCR requires that the PPM assess whether AIIB is in compliance with its ESP. The PPM reviews whether:

- The facts alleged in the RCR are substantiated.
- A direct causal link exists between the adverse impact and alleged AIIB noncompliance with the ESP.
- The alleged adverse impact is material.
- Management has adequately explained its actions pursuant to the ESP.
- The actions proposed by Management to resolve the issues raised in the submission are appropriate.

If the PPM determines that there has been noncompliance with the ESP, AIIB Management prepares a Management Action Plan (MAP) to address the PPM's findings of noncompliance. The PPM submits its findings to AIIB's Board of Directors. The MAP is subject to approval by AIIB's Board of Directors. The PPM also submits to AIIB's Board of Directors its review of monitoring reports prepared by AIIB's Management on implementation of the MAP.

For further details on when an RCR may be appropriate and how the process is conducted, please see Sections 3 through 6 (especially 6.7) of the PPM Rules of Procedure.

Confidentiality and Retaliation:

Requestors may ask for confidentiality. The request for confidentiality and the reasons for the request can be provided with the Requestors' submission.

The PPM considers any request for confidentiality and makes all reasonable efforts to grant the confidentiality requested.

In reviewing any request for confidentiality, the PPM assesses the risk of retaliation in connection with the submission. If the review identifies a risk of retaliation, the PPM notifies AIIB's Management and discusses actions Management may take to avoid increasing the risk to the safety of the Requestors, their families, in-country Authorized Representative and other relevant persons.

If confidentiality becomes an impediment to submission eligibility assessment or effective resolution of issues raised, the PPM advises the Requestors of these concerns and seeks to agree with the Requestors on how to proceed. Failing such agreement, the PPM may terminate review of the submission.

Appendix 20(a): Gazette Notification related Land Acquisition in Assam

RDM-11011/83/2022-LA-REV-Revenue & D.M

I/257750/2023

GOVERNMENT OF ASSAM
REVENUE &DISASTER MANAGEMENT (LR) DEPARTMENT
ASSAM SECRETARIAT (CIVIL): DISPUR: GUWAHATI – 6
NOTIFICATION
ORDERS BY THE GOVERNOR
Dated Dispur, the 23rd August, 2023

No.RLA.231013/37: The Governor of Assam is hereby pleased to amend the policy on "Land Acquisition through Direct Purchase by way of negotiated Settlement for all Department in the State of Assam" published in the Assam Gazette vide No. RLA.177/2021/3 dated 07/03/2022 in regards to waiting period for receiving objections from the land owners, valuation of immovable assets attached to the land, exemption of registration fees, valuation of structure/building of Department, cost of clearance of salvage materials and auction thereof, payment of compensation of zirat value on Govt. land, re-fixation on administrative cost, modification of multiplication factor and definition of urban area as follows:

SL. No	Para Amended	Amendment
1	Para 3 (vi) of Annexure-I	The existing provisions of paragraph 3 (vi)of Annexure-I shall be substituted by "(vi) Step 6: The list shall be published inviting objections, if any, regarding interest and ownership of the land, etc. For receiving objections from the land owners, a waiting period of 15 days shall be given."
2	Para 4 of Annexure-3	The existing provisions of paragraph 4 of Annexure-3 shall be replaced by "4. Simple valuation of immovable assets attached to the land: To facilitate quicker and simpler valuation on immovable assets on the land to be acquired, a few typical speculations of different categories of all possible immovable assets, attached to land may be defined. The guidance price of these typical assets may be prepared and vetted through appropriate authority. The valuation of immovable assets attached to the land will be calculated on pro-rata basis of the guidance price, with depreciation as per policy notified by PWD, Assam, from time to time, of the respective assets."
3	Inserting of new steps No. 3(xviii)	New provision of steps No. 3(xviii) shall be added by "Registration fees under the provision of 78(A) of Indian Registration Act 1908 in respect of instrument executed by or on behalf of or in favour of Government on land acquisition through direct purchase by way of negotiated settlement for all Departments shall be exempted."
4	Inserting of new steps No. 3(xix)	New provision of steps No. 3(xix) shall be added by "Value of structure/building to be assessed with 100% solatium in case of Government structure/building standing on the Government land and payment shall be made in favour of the Department whose structure belongs to."
5	Inserting of new steps No.	New provision of steps No. 3(xx) shall be added by "The cost for clearance of salvage materials shall be borne by

Appendix 20(b): Gazette Notification related to compensation in regard to RoW and tower footing for transmission lines

GOVERNMENT OF ASSAM
POWER (ELECTRICITY) DEPARTMENT
DISPUR, GUWAHATI - 6

(A)

NOTIFICATION

Dated Dispur the 10th March, 2017

No. PEL.219/2015/91: The Governor of Assam is pleased to notify the following rates for payment of compensation towards damages in regard to Right of Way for transmission lines. In accordance with the Guidelines of Ministry of Power, Govt. of India, vide Ref. No. 03/07/2015-Trans, dtd. 15.10.2015 for maintaining uniformity in compensation payment to the affected land owners during construction of transmission lines, it has been decided that a similar payment methodology towards compensation shall also be adopted in the State of Assam. These guidelines of payment methodology of compensation towards "damages" as stipulated in Section 67 & 68 of the Electricity Act, 2003 read with Section 10 and 16 of Indian Telegraph Act 1885 shall be in addition to the compensation towards normal crop and tree damages. This amount will be payable only for transmission lines supported by tower base of 66 KV and above, and not for sub-transmission and distribution lines below 66KV.

- Compensation @85% of land value as determined by Deputy Commissioner / BTC or any other competent authority based on Circle rate / Guideline value / Stamp Act rates for tower base area (between four legs at ground level) impacted severely due to installation of tower / pylon structure.
- Compensation towards diminution of land value in the width of Right of Way (ROW) corridor due to laying of transmission line and imposing certain restriction at a maximum rate of 15% of land value as determined by Deputy Commissioner or any other competent authority based on Circle rate / Guideline value / Stamp Act rates.

  For this purpose, the width of ROW corridor shall not be more than that prescribed in table at Annexure-I and shall not be less than the width directly below the conductors.
- In areas where land owner / owners have been offered / accepted alternate mode of compensation by concerned corporation / Municipality under Transfer Development Rights (TDR) policy of State, the licensee/utility shall deposit compensation amount as per (i) & (ii) above with the concerned Corporation / Municipality / Local Body or the State Government.

The above guidelines shall be effective from the date of issuance of the above mentioned Government of India guidelines and shall be applicable for only those new transmission line / projects where construction have started after this date i.e. 15.10.2015. This guideline shall not be applicable for existing transmission lines which are already in service or under construction before the aforesaid date or for maintenance of any existing transmission line.

ROW width for different voltage line*

Transmission Voltage	Width of Right of Way (In Meters)
66KV	18
110 KV	22
132KV	27
220 KV	35
400KV S/C	46
400KV D/C	46
+/-500KV HVDC	52
765 KV S/C (with delta configuration)	64
765 KV D/C	67
+/-800KV HVDC	69
1200 KV	89

- Width of Right of Way is as per Ministry of Environment & Forests (MoEF) guidelines dtd. 05.05.2014.

This issues with the concurrence of Revenue & Disaster Management Department, Govt. of Assam, as well as the Finance Department, Govt. of Assam.

-Sd/-

(Sri. Rajiv Kr. Bora, I.A.S.)
Additional Chief Secretary to the Govt. of Assam,
Power (Electricity), etc. Department

Memo No.PEL.219/2015/91-A Dated Dispur the 10th March, 2017

Copy to:

(1) The Managing Director, Assam Electricity Grid Corp. Ltd. (AEGCL), Bijulee Bhawan, Guwahati – 1
(2) The Executive Director, Power Grid Corp. of India Ltd. (PGCIL), Monal Tower, Dispur, Guwahati - 6
(3) P.S. to Hon'ble Chief Minister, Assam, Dispur, Guwahati - 6
(4) P.S. to Hon'ble Minister of State, Assam, Power, etc., Dispur, Guwahati - 6
(5) P.S. to the Addl. Chief Secretary to the Govt. of Assam, Revenue & Disaster Management Department, Department, Dispur, Guwahati - 6
(6) P.S. to the Chairman, APDCL, AEGCL, APGCL, Bijulee Bhawan, Guwahati – 1
(7) P.S. to Secretary to the Govt. of Assam, Power (Elect.), etc. Department, Dispur, Guwahati-6
(8) The Director, Assam Government Press, Bamunimaidam, Guwahati-21, Assam, for necessary action.

By order etc.,

Joint Secretary to the Govt. of Assam
Power (Elect.) Deptt.

Appendix 21: Format for Preparation of Resettlement Action Plan (RAP)

Introduction

- Brief Introduction of the sub-project
- Description of Component(s) that cause land acquisition/alienation and resettlement
- Overall Estimates of Land Acquisition and R&R

Measures to Minimize involuntary land acquisition/Resettlement

- Analysis of alternatives to avoid or minimize involuntary land acquisition/temporary loss of land
- Details of meaningful consultations with affected people and community about acceptable alternatives.

Impacts due to Project Intervention

- Summary of Impacts including: Details of Land Requirements, Project Affected Households/Persons, Loss of Trees, Crop Damage and Impacts on Structure etc.
- Loss of Common Property Resources
- Restrictions on Use of Land due tower footing and Row of transmission line.
- Details of Income Loss due to project intervention
- Details of affected Vulnerable Groups

Census and Socio-Economic Surveys

- The results of the census and socio-economic surveys
- Identify all categories of impacts and the extent of impact on each affected person/family; disaggregated by gender and caste.
- List out any impacts on Females and other vulnerable

Consultation and involvement of PAPs

- Describe various Stakeholders
- Describe the Consultation and involvement of PAPs
- List out and describe consultations with Females and other vulnerable
- Summarize process of consultation on the results of socio-economic surveys
- Describe how this process of consultation would becontinued through implementation and monitoring
- Describe the plan for disseminating information to Project Affected Persons

Policy and Legal Frameworks

- The Right to Fair Compensation and Transparency in Land Acquisition and Rehabilitation and Resettlement Act 2013 (RFCTLARR Act 2013)
- Assam Right to Fair Compensation and Transparency in Land Acquisition and Rehabilitation and Resettlement Rules, 2015 (ARFCTLARR Rules 2015)
- The Electricity Act, 2003
- The Indian Telegraph Act, 1885
- Govt. of Assam notification regarding RoW Compensation for Transmission Line and tower footing dated 10th March 2017.

- The Asian Infrastructure Investment Bank (AIIB)'s Environmental and Social Policy and Environmental and Social Standards (ESS) 2 (Involuntary Resettlement).

Entitlement Framework

- Provide a definition of PAFs and PAPs together with their categorization based on impacts
- Describe R&R entitlements for each category of impact
- Describe method of valuation used for affected land, structures and other assets
- Using Entitlement Matrix, present a table of all PAFs/PAPs and their losses/ impacts and entitlements
- List out compensation, R&R, livelihoods assistance to Females and other Vulnerable

Relocation (if applicable)

- Does the Project need community relocation sites? If yes, have they been inspected and accepted by PAPs?
- Have the Project Affected Persons agreed to the strategy for housing replacement? Will new housing be constructed/allocated? If PAPs are to construct houses, explain if compensation entitlement for housing is sufficient to help them construct houses.
- List of proposed sites along with number of affected families to be relocated
- Describe respective mechanisms for (i) procuring/acquiring/alienating; (ii) developing and (iii) allotting resettlement sites
- Provide detailed description of arrangements for development of resettlement sites including provision of social infrastructure
- Describe the feasibility studies conducted to determine the suitability of the development of sites.

Income Restoration

- Are the compensation entitlements sufficient to restore income streams for each category of impact? If not, what additional economic rehabilitation measures are necessary.
- Briefly spell out the restoration strategies for each category of impacts, and describe institutional, financial and technical arrangements/aspects involved.
- Describe the process of consultation with PAPs to finalize strategies for income restoration
- How do strategies for restoration vary with the area/locality of impact
- If income restoration involves change in livelihoods or other economic activities allow substantialamount of time for capacity building, accessing institutional funds/ credits/ markets, preparation and implementation.
- Work out the rate of returns for each of the economic activities opted by the entitled person.
- How are the risks of impoverishment proposed to be addressed?
- Explain the main institutional and other risks for effective implementation of plans for restoration of livelihood?
- Describe the process for monitoring the effectiveness of income restoration activities?

Institutional Arrangements

- Describe institution(s) responsible for: (a) delivery of each item/activity in the entitlement policy; (b) implementation of resettlement and rehabilitation programs and (c) coordination of all other activities as described in the Rehabilitation Action Plan.
- State how coordination issues will be addressed in cases where resettlement and rehabilitation are spread over a number of institutional/departmental jurisdictions?

- Indicate the agency that will coordinate all implementing agencies – do they have the necessary mandate and the resources?
- Describe the external (non-Project) institutions/departments involved in the process of resettlement and restoration of income such as land development, land allocation, credit, training for capacity building and the mechanisms in place to ensure adequate cooperation and performance of these institutions/departments?
- Describe the results of the institutional capacity assessment and give the institutional development plans including staffing schedule and training requirements?
- Discuss institutional capacity for, and commitment to, resettlement and rehabilitation.

Monitoring and Evaluation

- Describe the monitoring process
- Define key monitoring indicators for resettlement, rehabilitation and participation and provide a list of these indicators which would be used for monitoring
- Describe frequency of reporting and contents of reports
- Describe the process for integrating feedback from monitoring into implementation

Redressal of Grievances

- Describe the structure and process of grievances mechanisms at various levels including step-by-step process for registering and addressing grievances and provide specific details regarding registering complaints, discussing them with PAPs, response time, communication modes etc.
- Describe the mechanism for appeal
- Describe the provision, if any, to enable PAPs to approach civil courts in case these provisions fail.
- List all the grievances received, redressed and court cases, if any.

Implementation Schedule

- List the chronological steps in implementation of R&R Action Plan including identification of agencies responsible for each activity along with a brief explanation of each activity.
- A month-wise implementation schedule (Gantt chart) of activities to be taken as part of R&R Action Plan.
- Description of the linkage between R&R implementation and initiation of civil works for each of the Project component.

Costs and Budgets

- Clear statement of financial responsibility and authority
- List the sources of funds for R&R and describe the flow of funds
- Indicate costs of Land Acquisition, R&R and livelihoods
- Provide a cost-wise, item-wise budget estimate for the entire R&R costs including administrative expenses, monitoring and evaluation and contingencies
- Describe the specific mechanisms to adjust cost estimates by *inflation* factor
- Describe provisions to account for different types of contingencies