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

Environmental and Social Impact Assessment (ESIA)-Environmental and Social Management (ESMP) for the Proposed 132/33 kV GIS at Titabor and 132/33 kV AIS at Chabua (Package-B)

SUBMITTED TO

ASIAN INFRASTRUCTURE INVESTMENT BANK

PREPARED & SUBMITTED BY

ASSAM ELECTRICITY GRID CORPORATION LIMITED

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DOCUMENT INFORMATION

This Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) Report for the Construction of 132/33kV GIS at Titabor and 132/33kV AIS at Chabua (Package-B) under Assam Intra-State Transmission System Enhancement Project (AISTSEP) – Phase II, proposed to be financed by the Asian Infrastructure Investment Bank (AIIB), has been prepared under the guidance and leadership of the Assam Electricity Grid Corporation Limited (AEGCL).

We gratefully acknowledge the support and cooperation received from the Project Management Unit (PMU), AEGCL, the respective Project Implementation Units (PIUs), field-level staff, and stakeholders during the preparation of this report.

PREPARED BY:

Environmental Safeguard Specialists, PMU, AIIB Projects, AEGCL

1. Bodhaditya Roy
2. Rahul Choudhury

Social Safeguard Specialists, PMU, AIIB Projects, AEGCL

1. Dibya Jyoti Baruah
2. Sukanta Bhattacharjee

Report Finalization Date: 19th September 2025

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Assam Electricity Grid Corporation Limited (AEGCL)
Bijulee Bhawan (First Floor)
Paltan Bazar, Guwahati 781001, Assam
Phone: 0361-2739520
Website: www.aegcl.co.in

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LIST OF ABBREVIATIONS

AEGCL	Assam Electricity Grid Corporation Limited
AGM	Assistant General Manager
AIIB	Asian Infrastructure Investment Bank
AIS	Air Insulated Substation
AISTSEP	Assam Intra-State Transmission System Enhancement Project
ARAP	Abbreviated Resettlement Action Plan
ASBB	Assam State Biodiversity Board
ASDMA	Assam State Disaster Management Authority
ASTC	Assam State Transport Corporation
BMC	Biodiversity Management Committees
BOQ	Bill of Quantity
CEA	Central Electricity Authority
CESMP	Contractor's Environmental and Social Management Plan
CoP	Conference of Parties
CPCB	Central Pollution Control Board
CTE	Consent to Establish
CTO	Consent to Operate
CWRA	Central Wetlands Regulatory Authority
DC	Double Circuit
E&S officer	Environment and Social Officer
E&S Policy	Environmental and Social Policy
ESF	Environmental and Social Framework
ESS	Environmental and Social Standard
E&S	Environment and Social
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMPF	Environmental and Social Management and Planning Framework
ESS	Environmental and Social Standard
ESZ	Eco Sensitive Zone
GIS	Gas Insulated Substation
GoA	Government of Assam
GoI	Government of India
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HIV	Human Immunodeficiency Virus
HTLS	High Temperature Low Sag
IA	Implementing Agency
IoE	Inspectorate of Electricity
INR	Indian Rupee
IP	Indigenous Peoples
IPP	Indigenous People Plan

IUCN	International Union for Conservation of Nature and Natural Resources
Km	Kilometre
LILO	Loop In Loop out
MoEF&CC	Ministry of Environment, Forest and Climate Change
MVA	Mega Volt Ampere
NBA	National Biodiversity Authority
NBWL	National Board of Wildlife
NGO	Non-Government Organization
NGT	National Geern Tribunal
OPGW	Optical Power Ground Wire
PAPs	Project Affected Persons
PCB	Pollution Control Board
PFA	Power for All
PIU	Project Implementation Unit
PMC	Project Management Consultancy
PMU	Project Management Unit
SBWL	State Board of Wildlife
SEIAA	State Environment Impact Assessment Authority
S/S	Substation (s)
SC or S/C	Single Circuit
STU	State Transmission Utility
T&T	Tower and Transmission
TL	Transmission Line

WEIGHTS AND MEASURES

Ha. (hectare)	10,000 sq. m = 2.47105 Acre
km (kilometer)	1,000 meters
kV	kilovolt (1,000 volts

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Executive Summary

Background: The Asian Infrastructure Investment Bank (AIIB), through Government of India (GOI), has been approached by Government of Assam (GoA) for financial and technical assistance to upgrade and strengthen Assam's power transmission network under the Power for All (PFA) initiative. To enhance power supply reliability, AIIB has extended their support for the "Assam Intra-State Transmission System Enhancement Project" (AITSEP) being implemented by Assam Electricity Grid Corporation Limited (AEGCL). 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 (under implementation) and Phase II, with the anticipated outcome of significantly improving the reliability of the power network through these strategic interventions.

Phase-II of the project comprises construction of new 14 nos. of 220/132 kV and 132/33 kV GIS and AIS substations, as well as the associated transmission lines. The present Environmental and Social Impact Assessment-Environmental and Social Management Plan (ESIA-ESMP) report focuses on the proposed construction of two nos. of substations i.e. 132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS at Chabua, included in Package-B under **Phase II** of AISTSEP.

As part of AIIB's E&S policy and its compliance requirements as stipulated in the agreed Environmental and Social Management Planning Framework (ESMPF-Phase II) for the project, an Environmental and Social Impact Assessment including an Environmental and Social Management Plan (ESIA-ESMP) is to be in place for substations before commencement of the work. The present ESIA-ESMP report focuses on proposed new 132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS Chabua under Phase II of AISTSEP. ESIA-ESMP of the associated transmission lines under Package B for the both proposed sub-stations will be prepared separately after completion of check surveys.

Description of the Project: The detailed description of the proposed subproject locations is presented in the table below.

Name of Substation and T/L	GPS Coordinates	Location Village/Town	District	Name of the T&T Division	S/S Land Ownership	S/S Land Status	Area (Ha)	Terrain	Current Land-use
New 132/33 kV (2X50 MVA) GIS Substation at Titabor	26°36'58.79"N 94°15'02.20"E	Kharikatia Grant, Titabor	Jorhat	Golaghat	Tea Garden (Letekujan Tea Estate)	Transferred from Tea Estate Owner with Mutual Consent and Compensation	1.21	Plain	Tea Garden Land covered with tea bushes, grasses, shrubs and Siris tree
New 132/33 kV (2X50 MVA) AIS Substation at Chabua	27°27'55.34"N 95°11'27.57"E	Chabua	Dibrugarh	Dibrugarh	Tea Garden (Chabua Tea Estate)	Transferred from Tea Estate Owner with Mutual Consent and Compensation	3.62	Plain	Tea Garden Land covered with tea bushes, grasses, and Siris tree

The proposed subproject i.e. 132/33 kV (2X50 MVA) GIS at Titabor site is situated in Kharikatia Grant, a village located in Titabor, Jorhat district of Assam, India. Geographically, the site lies at latitude 26°36'58.79"N and longitude 94°15'02.20"E. Titabor Town is located at a distance of 22 kms from Jorhat Town. Gar-ali and Na-ali

are the two major roads connecting Titabor Town with district headquarter Jorhat. It is bounded by the Naga Hills on the South, Kakodonga river on the West, Kachajan river on the East the Choikota River on the North. Titabor Railway Station is at the heart of the Town and the nearest airport Rowriah, is at a distance of 25 kms. The economy of Titabor has further been improved by the big and medium sized Tea Gardens present in the region.

The proposed subproject i.e. 132/33 kV (2X50 MVA) AIS at Chabua site is situated in Chabua, a town located in Dibrugarh district of Assam, India. Geographically, the site lies at latitude 27°27'55.34"N and longitude 95°11'27.57"E. It is located between Dibrugarh town and Tinsukia town on NH-37 and lies 30 and 20 km from both the district towns respectively. The nearest rail station is Chabua r and the nearest airport is at Dibrugarh (Mohanbari airport) located at around 18.8 km. Chabua is characterized by picturesque tea estates, tranquil landscapes, and the presence of the mighty Brahmaputra River. The climate is typically humid and subtropical, making it ideal for tea cultivation. The economy of Chabua is primarily agrarian, with tea production being the major industry.

Existing facilities of the project: The 220/132 kV (2X160 MVA) Mariayani GSS is an existing facility of Assam Electricity Grid Corporation Limited (AEGCL). Proposed 132/33 kV (2X50 MVA) Titabor GIS will be charged from this existing facility with the construction of new 132kV Titabor (New)-Mariani (Existing) D/C Line (8.763 km).

Similarly, the Tinsukia (Existing)-Dibrugarh (Existing) S/C Line is an existing facility of Assam Electricity Grid Corporation Limited (AEGCL). Proposed 132/33 kV (2X50 MVA) Chabua AIS will be charged from this existing facility with the construction of new 132kV LILO S/C Line (1.402km).

As per the AIIB's ESF, 2024 both the subprojects do not encompass any associated facilities, reinforcing that its scope is limited to enhancing existing transmission infrastructures.

Land requirement for the 132/33 kV (2X50 MVA) Titabor GIS: During the site visit and stakeholder consultations held on 31/05/2025, 18/07/2025, and 19/07/2025, it was confirmed that the proposed site for the 132/33 kV (2x50 MVA) GIS Substation at Titabor is located on tea estate land, primarily comprising tea bushes, grasses, shrubs, and Siris trees (*Albizia lebbeck*). The designated plot, measuring 1.21 hectares, lies within the Letekujan Tea Estate under the Jorhat district, and features plain terrain.

The land was acquired by AEGCL on 07/10/2021 through negotiated settlement with the estate authority, M/s Kasojan Tea Company Pvt. Ltd., in coordination with the district administration. The compensation amount was determined in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR Act, 2013), ensuring transparency and fairness. Provisions under both the Assam Land (Requisition and Acquisition) Act, 1964 (ALAA 1964) and the RFCTLARR Act, 2013 were followed to expedite the land transfer process. The estate has confirmed that the compensation amount is being utilized to adjust and manage other available grant areas within the garden to maintain operational continuity.

The Letekujan Tea Estate has a total grant area of 303.61 hectares, with 229.80 hectares currently under tea plantation. Estate management has confirmed that adequate unutilized land is available to absorb the 1.21-hectare area transferred for the substation, without affecting tea cultivation or ongoing estate operations. Furthermore, the land transfer did not result in any displacement or disruption to tea garden workers or staff, nor did it affect their employment, residential arrangements, cultural practices, or access to public utilities.

Land requirement for the 132/33 kV (2X50 MVA) Chabua AIS: During the site visit and stakeholder consultations held on 30/05/2025 and 17/07/2025, it was confirmed that the proposed site for the 132/33 kV (2x50 MVA) AIS Substation at Chabua is located on tea estate land, primarily covered with tea bushes, grasses, and sparse

vegetation. The designated plot, measuring 3.62 hectares, lies within the Chabua Tea Estate, under the Chabua Revenue Circle in Dibrugarh district, and features plain terrain.

The land was acquired by AEGCL on 17/10/2022 through negotiated settlement with the tea estate authority, Amalgamated Plantations Pvt. Ltd. Although the transfer was carried out consensually, the compensation amount was determined in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR Act, 2013), to ensure fairness and transparency. Relevant provisions under both the Assam Land (Requisition and Acquisition) Act, 1964 (ALAA 1964) and the RFCTLARR Act, 2013 were applied to expedite the land transfer process. The estate has confirmed that the amount received is being utilized to adjust and manage other vacant grant areas within the tea garden to support continued operations.

The Chabua Tea Estate has a total grant area of 1307.76 hectares, with 760.42 hectares currently under tea plantation. The estate has confirmed that sufficient unplanted land remains available to accommodate the 3.62-hectare area transferred for the substation, without negatively impacting tea cultivation or estate operations. Additionally, the transfer did not result in any displacement or disruption of tea garden workers or staff, nor did it impact their employment, housing, cultural or religious practices, and access to public utilities.

Costs of the proposed subproject:

A. For 132 kV (2X50 MVA) GIS Substation at Titabor: INR 205.31 Crores
B. For 132 kV (2X50 MVA) AIS Substation at Chabua: INR 94.06 Crores

Policy, Legal and Administrative Framework: Power substation and transmission line construction projects have not been listed in the list of environmentally sensitive projects and hence, no Environmental Clearance (EC) is required, as per the Environmental Impact Assessment (EIA) notification of 2006 and its subsequent amendments by the Ministry of Environment, Forest and Climate Change (MoEF&CC). However, sub-project linked activities, such as quarry operations may necessitate prior Environmental Clearance (EC). AEGCL intends to commission this ESIA study for the proposed 132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS at Chabua (Package B) align with the requirements of AIIB's Environment and Social Policy (ESP) and Environment and Social Standards (ESSs). This ESIA and the resulting ESMP will outline measures to mitigate the environmental and social risks and impacts of the both subprojects in compliance with AIIB's ESP and ESSs.

As the Project is funded through the AIIB, the Bank's Environmental and Social Policy (ESP) applies. The project has been categorised as "Category B" as per AIIB's ESP with reservation as per the approved ESMPF and thus requires an ESIA–ESMP for these two proposed substations to be covered under its investment.

ESS-1 is applicable to the project as civil works may cause a limited number of potentially adverse environmental and social impacts. These impacts are not unprecedented and are limited to the project area confined in the project footprint area.

ESS 2: Involuntary Resettlement is considered applicable for the proposed substations at Titabor (Jorhat) and Chabua (Dibrugarh). In both cases, land was transferred to AEGCL through a negotiated settlement with private tea estate authorities (Letekujan Tea Estate for Titabor and Chabua Tea Estate for Chabua) with the involvement of the respective district administrations. The transferred parcels, measuring 1.21 hectares at Titabor (within a total grant area of 303.61 hectares, of which 229.80 hectares are under tea plantation) and 3.62 hectares at Chabua (within a total grant area of 1,309.76 hectares, of which 760.42 hectares are under tea plantation), were parts of operational tea estates not used for housing, worker settlements, critical infrastructure, or by informal users. These transactions caused no physical or economic displacement, nor any loss of access to livelihoods, communal facilities, or cultural resources. The estates retain sufficient unplanted grant areas to sustain agricultural operations, and the compensation received is being reinvested in tea plantation and land adjustments within the gardens. Letekujan Tea Estate employs 312 permanent workers (92 male, 220 female)

and 250 seasonal workers (80 male, 170 female), while Chabua Tea Estate employs 1,666 permanent workers (710 male, 956 female) and 1,200 seasonal workers (550 male, 650 female), with both estate authorities providing written confirmation that there will be no impact on workers' employment, housing, or access to facilities from the substation construction.ESS-3 is also not expected to be triggered. Site visits, public consultations, and stakeholder engagement confirmed that no indigenous communities or Scheduled Tribe populations reside in or around the proposed substation locations. Therefore, the project does not pose any direct or indirect impact on indigenous peoples or their lands, cultural resources, or livelihoods.

Description of the Environment: The proposed subproject sites i.e., 132/33 kV (2X50 MVA) GIS Substation at Titabor is situated in Jorhat district and 132/33 kV (2X50 MVA) AIS Substation at Chabua is situated in Dibrugarh district. Baseline data from secondary sources has been collected in the month of April and May, 2025 for the both subprojects. Site visit for primary data collection has been conducted on on May 30th and July 17th, 2025 for 132/33 kV AIS at Chabua site and May 31st, July 18th, July 19th, 2025 for 132/33 kV GIS at Titabor site by comprising team of Environmental & Social Experts of PMU along with PIU officials of AEGCL. The details of the baseline condition of substation are provided in the main report.

The direct impacts of the proposed subprojects are confined within the boundary of the proposed sites and indirect or induced impacts extends to the Area of Influence (AoI) defined by a buffer zone of 2 Km. A 10 Km radius is also considered for evaluating the impact on ecological and biological environment (flora & fauna) of the area. Additionally, sensitive receptors such as schools, hospitals, religious structures, and settlements have been specifically mapped within a 500-meter radius of each substation site to identify site-specific environmental and social risks.

The environmental and social attributes were assessed through both primary and secondary studies. Primary attributes including air environment, water, soil, noise, flora and fauna, and public consultation were evaluated through field visits, on-site monitoring and review of the past studies.

Secondary attributes such as land use patterns, geology, physiological characteristics, and socio-economic profile were analysed through literature review of previous studies conducted by government agencies & published articles/annual reports. An interdisciplinary team through discussions and professional judgment formulated the scoping and the extent of data generation.

The proposed 132/33 kV GIS site at Titabor in Jorhat district is located in Letekujan Tea Estate, operated by M/s Kasonjan Tea Company (P) Ltd. The surrounding area exhibits a mixed land use pattern, including tea plantations, general agricultural lands, vegetated zones, and limited built-up areas. Also, the proposed 132/33 kV AIS at Chabua is located within the Chabua Tea Estate, owned by Amalgamated Plantation Pvt. Ltd. The surrounding landscape demonstrates mixed land use, with tea gardens, agricultural fields, vegetated areas, and sparse built-up zones. A total of 6,521 tea bushes and 6 Siris trees (*Albizia lebbeck*), while the Chabua AIS site contains around 34,416 tea bushes and 92 Siris trees (*Albizia lebbeck*). These shade trees and tea bushes are proposed to be felled to allow for site clearance prior to the commencement of construction activities. These shade tree species (Schedule-II) is exemted from prior permission for felling from Forest Department as per "The Assam Trees Outside Forest (Sustainable Management Rules), 2022". Avenue plantation measures will be undertaken to offset the ecological loss. Additionally, no fruit/timber species, no endemic, introduced, or endangered species of trees have been observed within the premises of the both sites indicating minimal impact on local biodiversity.

Both subproject sites are neither located within nor adjacent to any designated Protected Areas (PAs), Eco-sensitive Zones (ESZs), Critical Habitats, Reserved Forests, notified historical, archaeological and cultural sites etc. The nearest protected area Hollongapar Gibbon WLS is found at a distance of 8.43 km from proposed 132 kV Titabor GIS site. It may be noted that anticipated impact on the protected and its species will be negligible considering the distribution extent of the species of Hoolock Gibbon (Hoolock hoolock) and Stumptailed Macaque (Macaca arctoides) near the subproject site of 132 kV Titabor GIS. Consultation with the nearby

community also do not reveal any sensitivity in terms of Hoolock Gibbon, Stumptailed Macaque or other wildlife movement in the subproject area and is thus less likely to have any adverse impact on the nearby protected areas.

Both subproject areas (Titabor and Chabua site) within the subproject districts (Jorhat and Dibrugarh) are characterized mainly by vegetation cover/ tea plantations, and uncultivated fallow land and a very few built-up areas. There are few industrial activities in both locations and so the major contributors of air pollution in the project area are mainly vehicular emission, dust emanation due to use of unpaved shoulders/ deteriorated roads by vehicles, and domestic fuel burning. It is thus anticipated that the rich in vegetation cover in subproject area will restrict the dispersion of the pollutants to the nearby sensitive receptors. Similarly, the major contributor of noise pollution in the subprojects area are mainly vehicular movement. Although the noise levels are typically localized and temporary, it is important to monitor and mitigate such disturbances to minimize inconvenience to nearby communities and comply with national noise standards.

Comprehensive Environmental Quality Monitoring Tests (EQMT) covering air, water, noise, and soil has been undertaken prior to the commencement of construction activities. The recorded PM_{10} concentrations at 132/33kV Titabor GIS and 132/33kV Chabua AIS were 42 µg/m³ and 46 µg/m³ respectively, which are significantly below the NAAQS 24-hour standard of 100 µg/m³. Also, the recorded $PM_{2.5}$ concentrations at 132/33kV Titabor GIS and 132/33kV Chabua AIS were 25 µg/m³ and 24 µg/m³ respectively, also well below the NAAQS threshold of 60 µg/m³. However, PM_{10} and $PM_{2.5}$ levels, though compliant with NAAQS, exceed WHO guidelines, 2021. In India, such exceedances are common due to road dust, vehicular emissions, and development activities. To mitigate impacts during substation construction, measures like water sprinkling, covering stockpiles, limiting dust-generating work during high winds, and providing PPE with awareness programs should be adopted.

The Leq (equivalent noise level) values at 132/33kV Titabor GIS was measured at 58.9 dB(A) and at 132/33kV Chabua AIS was measured at 54.9 dB(A) during the daytime, which are well within the permissible limit of 65 dB(A) for commercial areas as prescribed by the CPCB under The Noise Pollution (Regulation and Control) Rules, 2000. These measurements establish the definitive baseline conditions, against which any future deviations will be systematically monitored and addressed through appropriate mitigation measures as outlined in the Environmental and Social Management Plan (ESMP).

Impact Assessment: Environmental sensitive areas and Key Biodiversity Areas (KBA) are not located in the vicinity or adjacent to the both proposed subproject sites i.e. 132 kV (2X50 MVA) GIS at Titabor and 132 kV (2X50 MVA) AIS at Chabua. As assessed from the site visit and observation, the impacts are localized, temporary and manageable as no major environmental and social issues have been recorded. Details of impact and mitigation measures are discussed in the main report.

Environmental and Social Management Plan: ESMP for identified impacts and the administrative aspects to ensure that mitigative measures are implemented at both sites and their effectiveness monitored regularly through Environmental and Social Monitoring program has been detailed in the main report.

The ESMP cost to implement the key environmental & social measures and environmental & social monitoring plan which a part of Engineering Procurement Construction (EPC) Contractor's good Engineering practice, an amount of INR 85.41 Lakhs is estimated for implementation of ESMP at both sub-pproject locations.

Arrangement for Monitoring and Reporting of Assam Intra-State Transmission System Enhancement Project (AISTSEP) including Reporting Line (from contractor to AIIB) is in place and detailed in the main report. Capacity building programmes are being conducted by PMC as per the requirement and PMC contract provision. Apart from these, training and capacity building programme are being conducted by E&S team of AIIB to ensure implementation of E&S requirement.

Climate Risk Assessment and Adaptation at the Design Stage: Remedial measures for climate risks have been adapted for both the proposed sub-staions at design stage.

Stakeholder & Public Consultation and Information Disclosure: Public consultations were conducted with local habitants like economically poor communities, women, vulnerable groups and other local community leaders nearby both substation locations i.e. Chabua on 30th May and 17th July, 2025 and and Titabor on 31st May, 18th July and 19th July, 2025 respectively. This draft ESIA - ESMP will be disclosed online on the website of AIIB and AEGCL. The hardcopies of the same (English version) and Assamese version of the Executive Summary will be available at the following locations:

1) Project Director cum CGM(PP&D),
   Address: 1st Floor, AEGCL, Bijulee Bhawan,
   Contact No.: 0361-2739520
   Website: www.aegcl.co.in
2) Project Manager cum AGM, T &T Division, Golaghat
   Address: - T &T Division, Golaghat, AEGCL
   Email: agm.golaghat@aegcl.co.in
3) Project Manager cum AGM, Dibrugarh
   Address: - 132/33 kV Dibrugarh GSS, AEGCL
   Email: agm.dibrugarh@aegcl.co.in

The PMC, concern EPC contractor and PIU, officials of AEGCL will ensure that relevant environmental and social information from these documents is made available to affected communities and stakeholders in a timely, accessible, inclusive, and culturally appropriate manner, including translation into local language(s), particularly Assamese.

Grievance Redress Mechanism (GRM): To ensure environmentally and socially responsible implementation a free, multi-tiered Grievance Redress Mechanism (GRM) will be established to promptly address concerns or complaints from project-affected people or workers, helping to resolve issues efficiently and avoid litigation.

The GRM will consist of two levels of committees:

- Tier I – Operates at the field level.
- Tier II – Functions at the Project Management Unit (PMU) / Headquarters level.

The Project-affected People's Mechanism (PPM) has been established by AIIB to provide an opportunity for the independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by the AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRM or the AIIB's management processes. Information about the PPM is available at: ***https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html***

Summary, Recommendations and Conclusion: The ESMP provides a structured approach to ensure that the temporary impacts during construction are minimized, while also maximizing the positive benefits such as local employment opportunities, through effective management and monitoring.

It is recommended to implement all the mitigation measures outlined in Environmental and Social Management Plan, monitor Environmental and Social Monitoring Plan, continuous public consultation and maintaining GRM.

In conclusion, both the proposed subprojects will yield positive result in terms of reliable & enhanced power supply and the environment & social impacts identified in the ESIA study are manageable and can be mitigated effectively through preventive measures, and careful planning during the construction & operational phase.

Chapter 1: Introduction

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 Assam. 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-II of the project comprises construction of new 14 nos. of 220/132 kV and 132/33 kV GIS and AIS substations, as well as the associated transmission lines. The present Environmental and Social Impact Assessment-Environmental and Social Management Plan (ESIA-ESMP) report focuses on the proposed construction of two nos. of substations i.e. 132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS at Chabua, included in Package-B under **Phase II** of AISTSEP.

1.2 Purpose of the ESIA study

Power Substation and Transmission Line Construction projects have not been listed in the list of environmentally sensitive projects and hence, no Environmental Clearance (EC) is required, as per the Environmental Impact Assessment (EIA) notification of 2006 and its subsequent amendments by the Ministry of Environment, Forest and Climate Change (MoEF&CC). However, subproject linked activities, such as quarry operations may necessitate prior Environmental Clearance (EC). AEGCL intends to commission this ESIA study for both proposed subprojects i.e. 132 kV (2X50 MVA) GIS at Titabor and 132 kV (2X50 MVA) AIS at Chabua (Package B) to align with the requirements of AIIB's Environment and Social Policy (ESP) and Environment and Social Standards (ESSs). This ESIA and the resulting Environmental and Social Management Plan (ESMP) outline measures to mitigate the environmental and social risks and impacts of the subproject in compliance with AIIB's ESP and ESSs.

1.3 Objectives and scope of ESIA

The ESMPF which was developed for the overall Phase-II project under AISTSEP provides the guiding framework for the site specific ESIA study and ESMP in conformance with AIIB's ESP and ESSs. This ESIA-ESMP is prepared in line with the applicable laws and policies of GoI, GoA and AIIB's ESS considering the anticipated risks and impacts associated with these two proposed subprojects. The ESIA-ESMP will guide the subproject implementation and ensure that adequate measures are taken for managing and keeping any potential adverse environmental and social impacts at minimum while enhancing the significant positive and beneficial impacts associated with the proposed subproject activities.

In general, the scope of work for the study of ESIA shall be as follows:

a) Identification and review of the applicable policy, legal and institutional framework relevant to the proposed subprojects;
b) Description of the current baseline of both the subprojects in terms of physical, biological, ecological, social, cultural, and economic environment;
c) Analysis of alternatives (assessment of alternatives available for the proposed subprojects);
d) Identification of all potentially significant environmental and social impacts of the proposed subprojects;
e) Assessment of environmental and social impacts/risks as a result of subproject interventions, and suggest measures to avoid/ minimize/ mitigate negative impacts and derive the maximum from positive impacts;
f) Climate risk assessment and adaptation at the design stage as per 2015 Paris Agreement, finalized at the COP21 climate conference in Paris;
g) Stakeholder analysis (key expectations, impacts, issues as related to each stakeholder), public consultation and discloser;
h) Formulation and implementation of Environmental and Social Management Plan (ESMP) in accordance to AIIB safeguard policies;
i) Institutional arrangement to cover role and responsibility of various players at subprojects, districts and state level. Grievance redress mechanism, monitoring and evaluation plan including indicators, capacity building requirements to manage E&S issues, and ESMP budget.

This ESIA exclusively covers the substation components. Under the EPC mode of implementation, AEGCL provides preliminary designs, while the EPC contractor finalizes the detailed engineering for both substations and associated transmission lines. Substation design is typically completed and approved earlier due to its limited footprint, uniform topography, and consistent geotechnical conditions.

In contrast, transmission line design depends on post-award activities such as detailed route surveys, profiling, and geotechnical investigations at each tower location. These are essential for finalizing tower placements, foundation types, and alignment, factors influenced by variable terrain, land use, infrastructure crossings, and the need for statutory clearances. Consequently, critical environmental and social data, such as land ownership, RoW impacts, and proximity to sensitive receptors, become available only after the EPC contractor completes the detailed design and tower schedule.

1.4 Approach and key tasks for this ESIA study

The objective of conducting the ESIA is to ensure that the subproject is environmentally and socially sound and fits well with the community/ beneficiaries' needs and aspirations. The study therefore describes and quantifies the potential impacts on the physical environment, ecological and biological environment and the beneficiary and neighbouring populations prior to, during, and on completion of the subprojects. The approach adopted for the execution of the ESIA for both the subprojects is provided below:

Screening: Assessment for the requirements of national, state, international and AIIB's legal policy. Environmental Clearance is not required as per the EIA Notification of MoEF&CC. The subprojects have been categorised as "Category B" as per AIIB's E&S policy with reservation as per the approved ESMPF and thus requires an ESIA–ESMP for both proposed substations to be covered under its investment.

Scoping: A reconnaissance survey was conducted within the subprojects' footprint, covering areas within a 2 km radius and extending up to 10 km from the proposed substation boundaries to assess potential environmental and social sensitivities, including ecological conditions. Additionally, sensitive receptors such as schools, hospitals, religious structures, and settlements have been specifically mapped within a 500-meter radius

of each substation site to identify site-specific social and environmental risks. This scoping exercise was essential to delineate the study area, guide for primary data collection, and support impact identification.

Baseline data collection: Baseline data collection covered physical environmental features and socio-economic aspects within the subproject footprint, including a 2 km buffer and 10 km radius for biodiversity assessment from each substation boundary. Baseline data from secondary sources has been collected in the month of April and May, 2025. Site visit for primary data collection has been conducted on May 30th and July 17th, 2025 for 132/33 kV AIS at Chabua site and May 31st, July 18th, July 19th, 2025 for 132/33 kV GIS at Titabor site by comprising team of Environmental & Social Experts of PMU along with PIU officials of AEGCL. A detailed inventory and mapping of sensitive receptors within 500 meters of each substation site were also carried out to support risk assessment and inform mitigation planning.

Public and stakeholder consultations: Consultations were conducted for both the proposed substations on May 30th and July 17th, 2025 (for 132/33 kV AIS at Chabua) and May 31st, July 18th, and July 19th, 2025 (for 132/33 kV GIS at Titabor).

Impact Assessment: Impact Assessment has been done (identification, prediction and evaluation) based on the available data from primary & secondary sources and public consultation.

ESMP: Development of practical mitigation measures and management, monitoring plan, budget and institutional framework has been done in line with the approved ESMPF.

1.4.1 Key Tasks under this ESIA study

The following tasks were carried out by AEGCL team for this study:

Table 1 : Tasks undertaken for preparation of the ESIA-ESMP report

Sl. No.	Task	Details
1	Desk study/literature review	Prior to the site visit for screening, AEGCL-PMU conducted desk review of subproject specific secondary information.
2	Site reconnaissance	AEGCL-PMU team undertook a site reconnaissance visit at proposed subproject locations of 132/33 kV GIS at Titabor and 132/33 kV AIS at Chabua for screening and scoping exercise for the ESIA study. (RESA checklists are provided in (**Appendix 1 and Appendix 2**).
3	Site Visit and Consultations	AEGCL-PMU team conducted a site visit to the proposed substation locations on May 30th, May 31st, July 17th, July 18th, and July 19th, 2025. The visit aimed to gain a deeper understanding of the subprojects area and their surrounding environment through a comprehensive physical assessment. As part of the visit, stakeholder and public consultations were also Conducted. (Details of stakeholder and public consultation is given in **Chapter 10.**
4	Baseline data collection	Qualitative methods were largely employed for baseline data collection. Secondary data was gathered through desk research and literature reviews while primary data was obtained through physical observations, stakeholder and public discussions, and photography conducted during site visit.
5	Impact assessment	Following the identification of potential impacts, a detailed assessment was conducted to develop appropriate mitigation measures to minimize the potential impacts.
6	Analysis of Alternatives	For both substations at Titabor and Chabua, AEGCL initially explored the availability of government land to minimize social and environmental impacts. However, suitable government land was not available in either location. As an alternative, land parcels were identified within privately owned tea estates—Letekujan Tea Estate (operated by M/s Kasojan Tea Company Pvt. Ltd.) at Titabor

Sl. No.	Task	Details
		and Chabua Tea Estate (managed by Amalgamated Plantations Pvt. Ltd.) at Chabua. These parcels were selected through direct negotiation with the estate authorities and facilitated by the respective district administrations. The selected plots were not associated with worker settlements, community infrastructure, or critical operational zones. Instead, they consisted of tea bushes, grasses, and scattered trees within underutilized or non-core sections of the estates. Both tea estates confirmed the availability of sufficient unplanted grant areas to compensate for the transferred land, ensuring that tea cultivation and estate operations would continue uninterrupted. The compensation received is being reinvested for plantation activities in vacant areas to maintain production levels. The chosen sites are also strategically located adjacent to public roads, offering easy access for construction and future maintenance without requiring additional infrastructure. These decisions ensured that site selection was socially responsible, technically sound, and economically feasible, with no displacement, loss of livelihood, or long-term adverse impacts. (Details of Analysis of Alternatives is given in **Chapter 5**).
7	Development of an Environmental & Social Management Plan (ESMP) and Monitoring Plan (ESMoP)	Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMoP) are designed to ensure effective management and monitoring of environmental and social impacts identified during the assessment process. The ESMP outlines how the project will manage its environmental and social impacts during its lifecycle (design, construction and operation) whereas the ESMoP is a framework for monitoring and evaluating the effectiveness of mitigation measures outlined in the ESMPs.
8	Institutional arrangements	The existing institutional arrangements for the subproject; covering all key entities and the organization structure recommended in ESMPF for the Phase II of AIIB funded AISTSEP was taken into consideration while determining the implementation mechanism and roles and responsibilities at both subproject sites.
9	Grievance Redressal Mechanism	A multi-tiered Grievance Redress Mechanism (GRM) has been established for both the subprojects. The details of the GRMs are provided in **Chapter-12.**

1.5 Limitation of the ESIA study

This ESIA report is based on scientific principles and professional judgment applied to certain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the facts currently available within the limits of the scope of work, information available regarding both subprojects, availability of secondary data, stakeholder feedback, budget and schedule. The secondary data utilized for the purpose of baseline assessment in the subproject sites i.e. at Titabor, Jorhat District and Chabua, Dibrugarh District is limited to that available in the public domain. AEGCL's past and current experiences of conducting similar projects within the state of Assam has been utilized to collate baseline information. Additionally, the consultations undertaken during the site visits were limited to the stakeholders, who were available for consultation during the site visit; which included local community, stakeholders and Project site Team.

1.6 Report structure

The ESIA-ESMP report contains the following chapters:

Executive Summary: This chapter includes a brief summary of the ESIA- ESMP report.

Chapter 1: Introduction

This chapter includes background of the project, purpose of the ESIA study, objective and scope of ESIA, approach and key tasks for this ESIA study, limitations and structure of ESIA-ESMP report.

Chapter 2: Project description

This chapter provides comprehensive technical description of the subproject components, related infrastructure activities during different phases of the project, land requirement and allotment process and other relevant information.

Chapter 3: Policy, legal and institutional framework

This chapter outlines Constitutional Provisions, Policies and Regulations of the Governments of Assam and India and the AIIB's Environmental and Social Standards (ESSs) those are relevant to the subproject.

Chapter 4: Description of Environmental & Social Baseline Conditions

This chapter describes the Baseline Environmental and Social features in detail. It includes details about location characteristics, study area, physical environment, ecological and biological environment (flora and fauna) and social-economic baseline of the study area.

Chapter 5: Analysis of alternatives

This chapter elucidates detailed analysis about different options of site selection with considering design, environmental, social and economic aspects. The selection of final site with their justification is reflected in this chapter.

Chapter 6: Assessment for potential environmental and social impacts, its significance and mitigation measures

This chapter identifies potential risks and impacts on physical environment, ecological and biological environment and social environment associated with the subproject activities. It also outlines measures to mitigate these risks and minimize adverse effects.

Chapter 7: Environmental and Social Management Plan (ESMP) & Monitoring Plan (ESMoP) and Budget

This chapter presented the Environmental and Social Management Plan (ESMP), detailing the identified impacts and outlining the administrative framework necessary to ensure the implementation of mitigation measures and the monitoring of their effectiveness. This chapter also presents the Environmental and Social Monitoring Plan (ESMoP) for the project, along with the budgetary allocation required for the implementation of the Environmental and Social Management Plan (ESMP).

Chapter 8: Climate Risk Adaptation & Vulnerability Assessment

This chapter describes climate risks and adaptation taken at the design stage, and recommends measures that will improve the climate resilience of the project.

Chapter 9: Institutional arrangement for monitoring and reporting

The chapter addresses the institutional setup and capacity-building measures necessary for effective implementation of the Environmental and Social Management Plan (ESMP) and Environmental and Social Monitoring Plan (ESMoP). This involves defining roles and responsibilities of various entities involved in the project life-cycle.

Chapter 10: Stakeholder & public consultation and information disclosure

This chapter outlines the strategies and processes for engaging with stakeholders and the public. It elaborates stakeholder identification, stakeholder mapping and analysis, stakeholder consultations undertaken as part of the ESIA process and their participation in the project as a continuous process.

Chapter 11: Gender Action Plan

This chapter aims to ensure that both women and men benefit equitably from project interventions, with specific strategies to reduce gender disparities in access to project resources, employment, training, and decision-making opportunities.

Chapter 12: Grievance redress mechanism

This chapter establishes a mechanism for addressing grievances and complaints arises during implementation of the project. It ensures that affected parties have a channel through which they can express concerns and seek resolution.

Chapter 13: Summary, recommendations and conclusion

This chapter summarize the impacts, mitigation and management plans of the subproject activities with recommendations and conclusion.

Appendices: Appendices of the project related documents shall be detailed at the end of the report.

Chapter 2: Project Description

The project, AISTSEP Phase II, is also dedicated to expanding the state's electricity transmission capacity by constructing new power substations, associated transmission lines, and complementary infrastructure. This initiative aims to enhance energy accessibility for industries and businesses while reducing transmission losses and supports economic growth and sustainability. This chapter provides a detailed overview of the proposed subprojects, including the planned locations for the newly proposed 132/33 kV GIS at Titabor and 132/33 kV AIS at Chabua (included in Package B) and the scope of related infrastructure enhancements.

2.1 Subproject locations and description

2.1.1 132/33 kV (2X50 MVA) GIS at Titabor

The proposed subproject i.e. 132/33 kV (2X50 MVA) GIS at Titabor site is situated in Kharikatia Grant, a village located in Titabor, Jorhat district of Assam, India. Geographically, the site lies at latitude 26°36'58.79"N and longitude 94°15'02.20"E. Titabor Town is located at a distance of 22 kms from Jorhat Town. Gar-ali and Na-ali are the two major roads connecting Titabor Town with district headquarter Jorhat. It is bounded by the Naga Hills on the South, Kakodonga river on the West, Kachajan river on the East the Choikota River on the North. Titabor Railway Station is at the heart of the Town and the nearest airport Rowriah, is at a distance of 25 kms. The economy of Titabor Sub-Division is mainly based on agriculture. The main agricultural product of the region is paddy. Women of the region are also expert weavers and they produce Eri, Muga and Silk clothings which are sustainable income source for many of them. The economy of Titabor has further been improved by the big and medium sized Tea Gardens present in the region.

Table 2: Subproject locations details for 132/33 kV GIS at Titabor

Name of Substation and T/L	GPS Coordinates	Location Village/Town	District	Name of the T&T Division	S/S Land Ownership	S/S Land Status	Area (Ha)	Terrain	Current Land-use
New 132/33 kV (2X50 MVA) GIS Substation at Titabor	26°36'58.79"N 94°15'02.20"E	Kharikatia Grant, Titabor	Jorhat	Golaghat	Tea Garden (Letekujan Tea Estate)	Transferred from Tea Estate Owner with Mutual Consent and Compensation	1.21	Plain	Tea Garden Land covered with tea bushes, grasses, shrubs and Siris tree

Figure 1: Photograph showing Proposed site of 132/33 kV GIS at Titabor

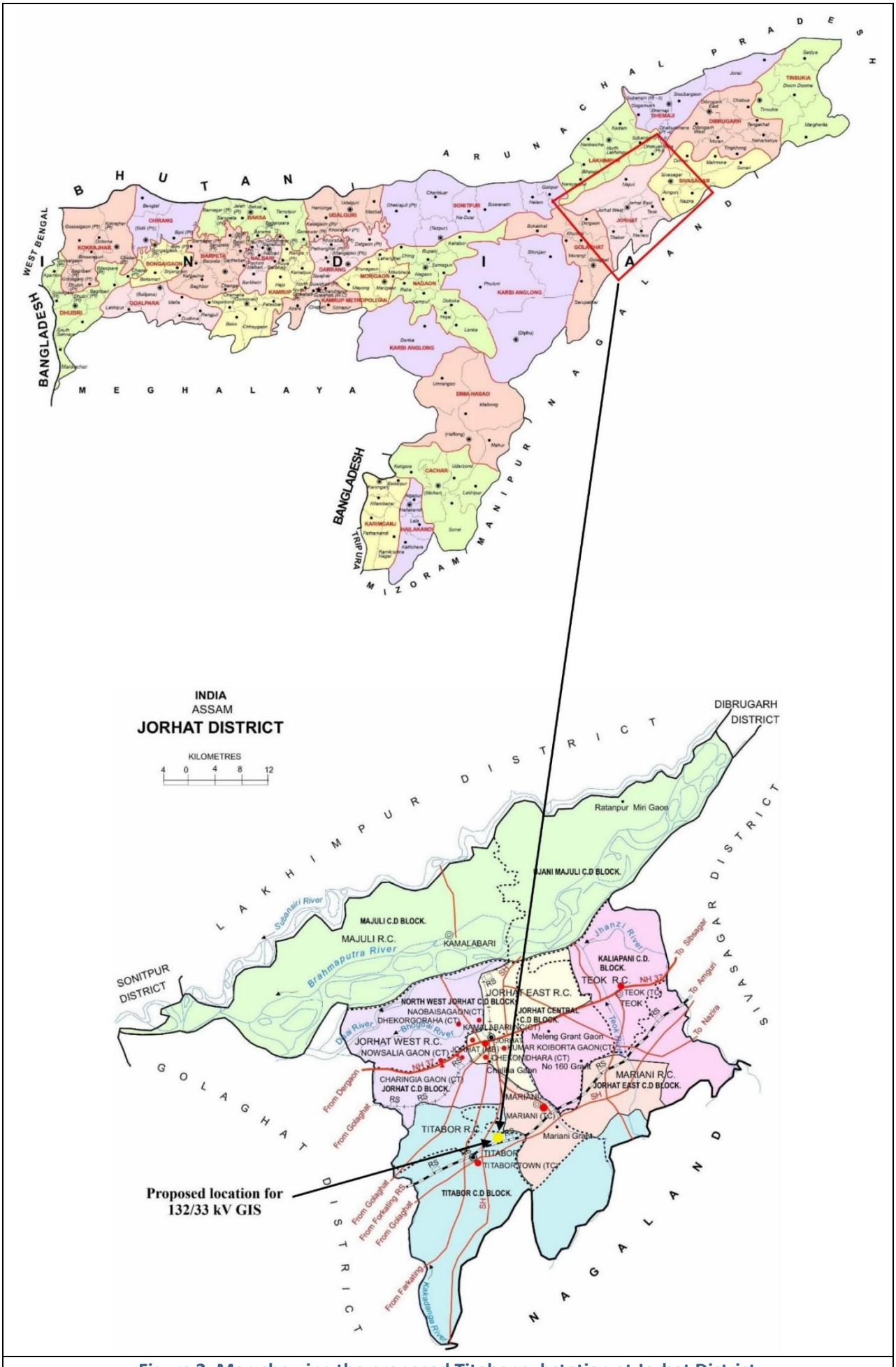

Figure 2: Map showing the proposed Titabor substation at Jorhat District

2.1.2 132/33 kV (2X50 MVA) AIS at Chabua

The proposed subproject i.e. 132/33 kV (2X50 MVA) AIS at Chabua site is situated in Chabua, a town located in Dibrugarh district of Assam, India. Geographically, the site lies at latitude 27°27'55.34"N and longitude 95°11'27.57"E. It is located between Dibrugarh town and Tinsukia town on NH-37 and lies 30 and 20 km from both the district towns respectively. The nearest rail station is Chabua r and the nearest airport is at Dibrugarh (Mohanbari airport) located at around 18.8 km. Chabua is characterized by picturesque tea estates, tranquil landscapes, and the presence of the mighty Brahmaputra River. The climate is typically humid and subtropical, making it ideal for tea cultivation. The natural beauty of the area, with its green expanses and serene environment, makes Chabua a peaceful retreat from urban life. The economy of Chabua is primarily agrarian, with tea production being the major industry. Numerous tea gardens surround the town, providing employment to a large number of local residents. Besides tea, the people of Chabua also engage in agriculture, small-scale trade, and services. The lifestyle here is simple and closely tied to the rhythms of nature and agriculture.

Table 3 : Subproject locations details for 132/33 kV GIS at Chabua

Name of Substation and T/L	GPS Coordinates	Location Village/Town	District	Name of the T&T Division	S/S Land Ownership	S/S Land Status	Area (Ha)	Terrain	Current Land-use
New 132/33 kV (2X50 MVA) AIS Substation at Chabua	27°27'55.34"N 95°11'27.57"E	Chabua	Dibrugarh	Dibrugarh	Tea Garden (Chabua Tea Estate)	Transferred from Tea Estate Owner with Mutual Consent and Compensation	3.62	Plain	Tea Garden Land covered with tea bushes, grasses, and Siris tree

Figure 3: Photograph showing Proposed site of 132/33 kV AIS at Chabua

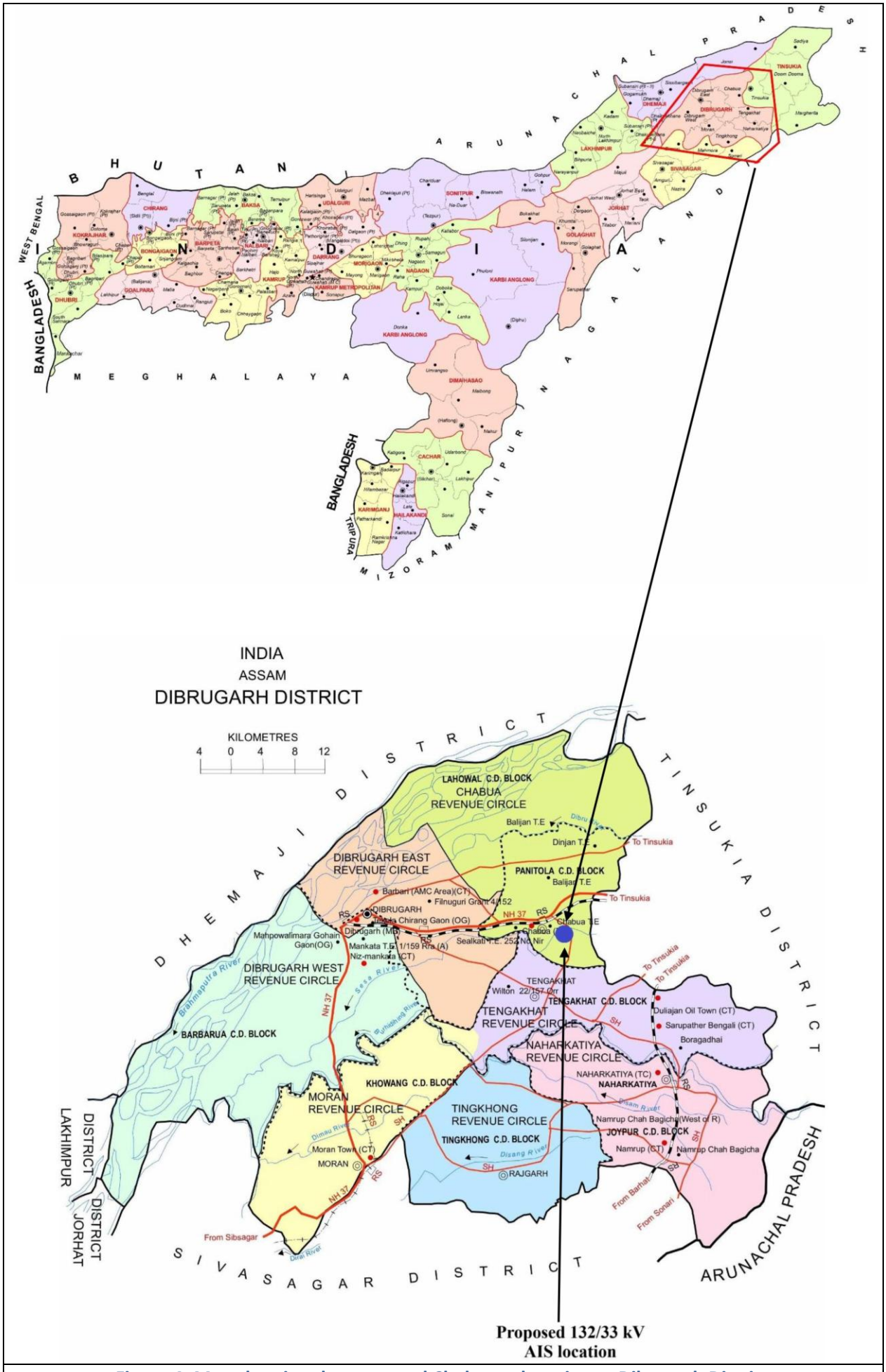

Figure 4: Map showing the proposed Chabua substation at Dibrugarh District

2.2 Subproject component features

The proposed 132/33 kV GIS at Titabor will be developed on a 1.21-hectare land parcel located in Kharikatia Grant village of Jorhat district, Assam. Similarly, the proposed 132/33 kV AIS at Chabua will be constructed on a 3.62-hectare land parcel located in Chabua Town in Dibrugarh district, Assam. The layout design for both the substations is appended in **Appendix 3** and **Appendix 4** of this report. The entire area for both the subprojects will be demarcated by a boundary wall, within which all substation components are systematically arranged as per standard engineering practice. Landscaping and plantation provisions are incorporated in the layout plan and will be carried out in areas free from electrical hazard zones, primarily along the boundary periphery and other non-electrified pockets within the premises. The key electrical components are provided in **Table 4** and **Table 5**.

Table 4: 132/33 kV (2X50 MVA) Titabor GIS components

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

Table 5: 132/33 kV (2X50 MVA) Chabua AIS components

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

Subproject Linked activities and access road:

Construction materials for both the substations like sand, aggregates, bricks, etc. will be sourced from nearby government-approved suppliers. These sources will have valid statutory approvals such as Environmental Clearance (EC), Consent to Establish and Consent to Operate by Assam State Pollution Control Board, ensuring compliance with applicable environmental regulations. Final selection of material sources will be made by the EPC contractor upon mobilization and will be subject to verification and approval by the PIU and PMU. All sourcing activities will adhere to the prevailing state regulations, including payment of applicable royalties as per Assam Government norms. The estimated earthwork requirement for site development and leveling is **18,000 cubic meters** for 132/33 kV GIS at Titabor and **40,000 cubic meters** for 132/33 kV AIS at Chabua.

Both proposed substation sites are well connected by all-weather motorable roads. The Titabor GIS in Jorhat district is accessible via the Jorhat-Titabor-Mariyani route along Dhodar Ali Road leading to Mariyani Town. The

roads ranging from 9 to 10 meters in width will facilitate the movement of construction vehicles and equipment. The Chabua AIS in Dibrugarh district is located in Chabua Town and is connected via a metalled road to the Chabua-Tengakhat route, with proximity to Assam Trunk Road. Roads in Chabua are 7 to 9 meters wide, ensuring smooth transportation of materials, equipment, and personnel throughout the year.

2.4 Existing facilities of the subprojects

The 220/132 kV (2X160 MVA) Mariayani GSS is an existing facility of Assam Electricity Grid Corporation Limited (AEGCL). Proposed 132/33 kV (2X50 MVA) Titabor GIS will be charged from this existing facility with the construction of new 132kV Titabor (New)-Mariani (Existing) D/C Line (8.763 km).

Similarly, the Tinsukia (Existing)-Dibrugarh (Existing) S/C Line is an existing facility of Assam Electricity Grid Corporation Limited (AEGCL). Proposed 132/33 kV (2X50 MVA) Chabua AIS will be charged from this existing facility with the construction of new 132kV LILO S/C Line (1.402km).

According to AIIB's Environmental and Social Framework (ESF) 2024, associated facilities are define as: activities that are not included in the description of the Project set out in the Legal Agreements governing the Project (not financed by the project), but are determined to: (a) directly and materially related to the Project; (b) carried out, or planned to be carried out, contemporaneously with the Project; and (c) necessary for the Project to be viable and would not be carried out if the Project did not exist. As per the AIIB's ESF, 2024 both the proposed subprojects do not encompass any associated facilities.

2.5 Manpower requirement for the subprojects

The EPC contractor will be responsible for the overall engineering, procurement, supply, construction, erection, installation, and commissioning of the project. Sub-contractors may be engaged to carry out specific components of the work, as required. During the construction phase of the subprojects, the estimated number of workers will vary based on the nature and stage of activities being undertaken.

Site preparation and earthwork are expected to involve approximately 15–20 workers. Foundation and civil works will require the highest labor force, with an estimated 50–60 workers. Structural erection, including installation of equipment structures and gantries, will engage around 25–30 workers. Electrical equipment installation will necessitate approximately 15–20 workers, while cable laying and termination, as well as the earthing and lightning protection system, will each require about 10–15 workers. Additionally, around 20–25 workers will be involved in switchyard graveling, and the construction of internal roads and drainage systems. These estimates are indicative and subject to variation depending on actual site conditions and subproject requirements during implementation.

During the construction phase, the total workforce across all activities is expected to comprise roughly 48–50% unskilled, 30–32% semi-skilled, and 18–20% skilled labour. The majority of unskilled labour will be sourced locally to maximize community employment opportunities, while preference for semi-skilled positions will also be given to local candidates wherever feasible. Skilled positions will primarily be filled by specialized workers with relevant experience in substation construction and installation. Overall, it is estimated that about 60–65% of the total workforce will be local labour. Across all categories, efforts will be made to ensure that at least 30% of the workforce are women, promoting gender inclusion in project activities.

2.6 Land requirement for the subprojects

A. 132/33 kV (2X50 MVA) GIS at Titabor

During the site visit and stakeholder consultations held on 31/05/2025, 18/07/2025, and 19/07/2025, it was confirmed that the proposed site for the 132 kV (2x50 MVA) GIS Substation at Titabor is located on tea estate land, primarily comprising tea bushes, grasses, shrubs, and Siris trees (Albizia lebbeck). The designated plot, measuring **1.21 hectares**, lies within the Letekujan Tea Estate under the Jorhat district, and features plain terrain.

The land was acquired by AEGCL on **07/10/2021** through negotiated settlement with the estate authority, M/s Kasojan Tea Company Pvt. Ltd., in coordination with the district administration (**Refer Appendix 5**) . Although the process was carried out through consent and negotiation, the compensation amount was determined in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR Act, 2013) under section 26(1), 28, 29 and 30 to ensuring transparency and fairness *(**land compensation documents is appended in Appendix 6A & 6B and the possession certificate is appended in Appendix 6C)***. Provisions under section 3(1) and 6(1) of the Assam Land (Requisition and Acquisition) Act, 1964 (ALAA 1964) and the RFCTLARR Act, 2013 were followed to expedite the land transfer process. The estate has confirmed that the compensation amount is being utilized to adjust and manage other available grant areas within the garden to maintain operational continuity. *(A confirmation letter from the garden authority is attached as **Appendix 5**.)*

The Letekujan Tea Estate has a total grant area of **303.61 hectares**, with **229.80 hectares** currently under tea plantation. Estate management has confirmed that adequate unutilized land is available to absorb **the 1.21-hectare** area transferred for the substation, without affecting tea cultivation or ongoing estate operations. Furthermore, the land transfer did not result in any displacement or disruption to tea garden workers or staff, nor did it affect their employment, residential arrangements, cultural practices, or access to public utilities. Moreover, as discussed with the Tea Estate authorities during the stakeholder consultation held on **18th July 2025** (details provided in **Chapter 10**), the estate currently employs 312 permanent workers (92 male and 220 female) and 250 seasonal workers (80 male and 170 female), all of whom remain engaged without any interruption. No informal users were identified within the land parcel earmarked for the substation.

B. 132/33 kV (2X50 MVA) AIS at Chabua

Similarly, during the site visit and stakeholder consultations held on **30/05/2025 and 17/07/2025**, it was confirmed that the proposed site for the 132/33 kV (2x50 MVA) AIS Substation at Chabua is located on tea estate land, primarily covered with tea bushes, grasses, and sparse vegetation. The designated plot, measuring 3.62 **hectares**, lies within the Chabua Tea Estate, under the Chabua Revenue Circle in Dibrugarh district, and features plain terrain.

The land was transferred to AEGCL on **17/10/2022** through negotiated settlement with the tea estate authority, Amalgamated Plantations Pvt. Ltd., (**Refer Appendix -7)**. Although the transfer was carried out consensually, the compensation amount was determined in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR Act, 2013) under section 26(1), 28, 29 and 30, to ensure fairness and transparency (***land compensation documents is appended in Appendix -8A & 8B, and correspondence from ADC (L.A) Dibrugarh to the Circle Officer, Chabua Revenue Circle for Mutation of Land record is appended in Appendix -8C***). Relevant provisions under section 3(1) and 6(1) of the Assam Land (Requisition and Acquisition) Act, 1964 (ALAA 1964) and the RFCTLARR Act, 2013 were applied to expedite the land transfer process. The estate has confirmed that the amount received is being utilized to adjust and manage other vacant grant areas within the tea garden to support continued operations. (A confirmation letter from the garden authority is attached as **Appendix 7**.)

The Chabua Tea Estate has a total grant area of **1307.76 hectares**, with **760.42 hectares** currently under tea plantation. The estate has confirmed that sufficient unplanted land remains available to accommodate the **3.62-hectare** area transferred for the substation, without negatively impacting tea cultivation or estate operations. Additionally, the transfer did not result in any displacement or disruption of tea garden workers or staff, nor did it impact their employment, housing, cultural or religious practices, and access to public utilities. Moreover, during the stakeholder consultation held on **17th July 2025** (details provided in **Chapter 10**), the estate authorities reported it has 1,666 permanent workers (710 male and 956 female) and 1,200 seasonal workers (550 male and 650 female), all of whom continue to be engaged without any interruption. They further confirmed that no informal users were present within the parcel of land transferred for substation construction.

2.7 Costs and implementation schedule

The total cost for the construction of the proposed 132 kV (2X50 MVA) GIS at Titabor is INR 205.31 crores and the total cost for the construction of the proposed 132 kV (2X50 MVA) AIS at Chabua is INR 94.06 crores. The detailed implementation schedule for both proposed subprojects is provided in **Table 6.**

Table 6: Implementation schedule for construction of proposed 132/33 kV Titabor GIS and 132/33 kV Chabua AIS

Sl. No.	Job Description	Time Scale (in Years)											
		Y1 (2025)		Y2 (2026)				Y3 (2027)				Y4 (2028)	
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Signing of Contract Agreement												
2	Design/Drawing approval												
3	Civil Works												
4	Testing & Inspection of Equipment												
5	Transportation to Site												
6	Erection of Equipment												
7	Cable laying and Termination												
8	Testing and Commissioning												
9	Monitoring of ESMP Implementation and reporting												
10	Stakeholder and Public Consultation												
11	Taking over by AEGCL												

Chapter 3. Legal and Regulatory Framework

This chapter reviews existing policies, legislation, and regulations relevant to the implementation of the Environmental and Social Management Plan (ESMP). It highlights the requirements that govern the management of environmental and social (E&S) risks and impacts associated with the proposed subproject. Various frameworks from the Government of India (GoI), Government of Assam (GoA), and international conventions are identified as pertinent. Additionally, since this subproject is financed by the Asian Infrastructure Investment Bank (AIIB), its guidelines are crucial and are thoroughly addressed. The applicable legal and regulatory frameworks are essential for the effective management of environmental and social aspects. These include requirements related to site selection criteria, environmental pollution control measures, institutional mechanisms, occupational and community health and safety standards, efficient resource utilization, and cultural and social considerations.

3.1 Constitutional Provisions

The Constitution of India (1950) stands out for including specific provisions aimed at protecting and improving the nation's environment. As a sequel to the UN Conference on the Human Environment (1972), Indian Parliament in 1976 amended the Constitution of India by introducing articles 48A and 51A.

Article 48 A
"The State shall endeavor 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.

3.2 GoI and GoA Laws/Regulations/Policies

Table 7 : Environmental and Social Policies and Regulatory Framework (National and Assam State Regulation)

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
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.	Applicable; Power Substation and Transmission Line Construction 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	EPC Contractor / PMC / AEGCL
2.	EIA Notification, 2006 and subsequent amendments	EIA notification 2006 and its subsequent amendments lists out type of projects that requires EIA study and Environmental Clearance from MoEF&CC or State EIA Authority.	Not Applicable; The construction of substation 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.	National Environment Policy (NEP), 2006	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by Central, State and Local Government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.	Applicable; should adhere to NEP conservation of environmental resources and abatement of pollution.	MoEF & CC / Central State Pollution Control Board (CPCB) / Pollution Control Board (PCB), Assam	EPC Contractor / PMC / AEGCL
4.	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	Applicable; respected to area where development activities may cause any damage to environment and property.	National Green Tribunal (NGT)	EPC Contractor / PMC / AEGCL

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
		relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto.			
5.	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. Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards notified.	Applicable; Power Substation and Transmission Line Construction 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 subproject construction phase).	MoEF & CC/CPCB	EPC Contractor / PMC / AEGCL
6.	Eco-Sensitive Zone Notifications	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.	Not applicable; none of the subproject activity falls within declared ESZ.	Department of Environment and Forest, Assam and MoEF & CC, New Delhi	-
7.	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.	Not Applicable, no notified forest land within the subproject area.	Department of Environment and Forest, Assam, IRO-MoEF & CC, Guwahati.	-
8.	National Forest Policy, 1988	It articulates the twin objectives of ecological stability and social justice; recognizes people's dependence and their symbiotic relation with forest, emphasizes protection	Not Applicable, no notified forest land within the subproject area.	Department of Environment & Forest, Assam and MoEF&CC, New Delhi	-

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
		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.			
9.	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 people.	Not Applicable	Department of Environment and Forest, Assam	-
10.	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.	Not Applicable; subproject is not located within Wildlife Sanctuary, National Park, wildlife corridors, etc.	Department of Environment and Forest, Assam, SBWL, and NBWL-MoEF&CC, New Delhi	-
11.	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.	Not Applicable	National Biodiversity Authority (NBA), Assam State Biodiversity Board (ASBB) and Biodiversity Management Committees (BMCs)	-
12.	The Compensatory Afforestation Fund Act, 2016 State Compensatory Afforestation Fund Management and	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	Not Applicable, no notified forest land within the subproject area.	Department of Environment and Forest, Assam and MoEF&CC, New Delhi.	-

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
	Planning Authority Forest (Conservation) Amendment Rules, 2014	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			
13.	The Assam Compensatory Afforestation Fund Rules, 1994	Provision to constitute a Fund for the purpose of Compensatory Afforestation to be raised against the Forest Area diverted for non-forest use under the provisions of Section 4(1) of the Forest (Conservation) Act, 1980	Not Applicable, no notified forest land within the subproject area.	Department of Environment and Forest, Assam	-
14.	Assam (Control of Felling & Removal of trees from Non-Forest Land) Rules 2002 and subsequent amendment	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 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.	Applicable	Department of Environment and Forest, Assam	AEGCL/EPC Contractor
15.	The Assam Trees Outside Forest (Sustainable Management Rules), 2022	Provides regulation for Tree Cutting Permission outside forest in a sustainable manner.	Not applicable. Note: Approx. 6 nos. and 92 nos. of Siris trees (*Albizia lebbeck*) are proposed to be felled in Titabor GIS site and Chabua AIS site respectively before construction. According to this act, this shade tree species (Schedule II) is exemted from prior permission for felling from Forest Department. However, compensation for these trees has already	Department of Environment and Forest, Assam.	EPC Contractor / PMC / AEGCL

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
			been transferred to the tea estate owners for the both subproject sites.		
16.	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.).	Not applicable; subproject activity does not fall within declared wetland areas.	Central Wetlands Regulatory Authority (CWRA)	-
17.	Air (Prevention and Control of Pollution) Act, 1981 and subsequent amendments The Air (Prevention & Control of Pollution) Assam Rule, 1991	This Act establishes ambient air quality standards[1] to provide for the prevention, control and abatement of air pollution. The Act also establishes ambient air quality standards.	Applicable; based on the project scale of civil works during construction phase and other ancillary activities (minor to moderate fugitive dust emission is expected). Implementing measures to mitigate air pollution from project activities; construction facilities.	State Pollution Control Board, Assam. Consent to Establish (CTE) and Consent to Operate (CTO) to be obtained by contractor for operation of DG sets and procurement of construction materials.	EPC Contractor / PMC / AEGCL
18.	Water Prevention and Control of Pollution) Act, 1974 and subsequent amendments The Water (Prevention & Control of Pollution) Assam Rule, 1977	This Act was enacted to provide standards[2] for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, by Central and State Pollution Control Boards and for conferring on and assigning to CPCB/SPCBs powers and functions relating to water pollution control. Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974.	Applicable; to manage liquid effluent discharges from construction and or from domestic activities. Implementing measures to mitigate water pollution from project activities; construction facilities.	State Pollution Control Board, Assam. Prevention of water pollution due to project activities.	EPC Contractor / PMC / AEGCL
19.	Noise Pollution (Regulation and Control Act) 2000 and	The Rules stipulate ambient noise limits[3] during daytime and night time for industrial, commercial, residential and ecologically	Applicable; since minor to moderate noise emission from proposed activities during construction stage like operation of DG sets,	Central Pollution Control Board & State Pollution Control Board, Assam	EPC Contractor / PMC / AEGCL

[1] *NAAQS table*
[2] *Water standard annexure*
[3] *Ambient Quality Standards in respect of noise*

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
	subsequent amendments	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.	construction machineries and vehicles and concrete mixers of applicable ratings. Contractors need to ensure all noise-producing activities during civil works conform to standards.		
20.	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; AEGCL will seeks authorisation for disposal of hazardous waste from concerned State Pollution Control Board (SPCB), Assam as and when required. The transformer oil can be auctioned to authorised/registered re-refiners and information to the respective SPCB.	State Pollution Control Board, Assam, Local Municipal Board (MCB) and other Local Bodies. Contractor needs to submit plan for reuse or safe disposal.	EPC Contractor / PMC / AEGCL
21.	Manufacture Storage, & imports of Hazardous Chemicals Rules, 1989 and subsequent amendments	Usage and storage of hazardous substances.	Applicable. Use of SF_6 as insulator in the circuit breakers.	State Pollution Control Board, Assam.	EPC Contractor / PMC / AEGCL
22.	Construction and Demolition Waste Management Rules, 2016	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.	Not applicable	State Pollution Control Board, Assam, Local Municipal Board (MCB) and other Local Bodies. Contractor needs to submit plan for reuse or safe disposal.	-
23.	Solid Waste management Rules, 2016	The rules provide guidance for safe disposal and collection municipal solid waste.	Applicable. All forms/types of solid waste generated during subproject construction activities	State Pollution Control Board, Assam and Local Municipal Board (MCB). Contractor needs to submit plans for its safe disposal/burial.	EPC Contractor / PMC / AEGCL
24.	Plastic waste management Rules, 2016	The rules provide a regulatory frame work for management of plastic waste generation minimization, source segregation, recycling and disposal effectively.	Applicable. Plastic waste generation from proposed subproject activities. Safe disposal as per rules	State Pollution Control Board, Assam, Local Municipal Board (MCB) and other Local Bodies.	EPC Contractor / PMC / AEGCL
25.	E-waste Management Rules, 2016	The rules are applicable to the consumers of electrical and electronic equipment. Large consumers of electrical and electronic	Applicable but limited to the consumers that generate significant quantities of e-waste.	Central Pollution Control Board & State Pollution Control Board, Assam	EPC Contractor / PMC / AEGCL

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
		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.			
26.	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.	Applicable. Backup power supply	State Pollution Control Board, Assam	EPC Contractor / PMC / AEGCL
27.	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)	EPC Contractor / PMC / AEGCL
28.	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	EPC Contractor / PMC / AEGCL
29.	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	EPC Contractor / PMC / AEGCL
30.	Disaster Management Act, 2005	This act provides an effective management of disasters and for matters connected therewith or incidental thereto.	The proposed subproject area falls 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)	EPC Contractor / PMC / AEGCL

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
31.	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 subproject implementation for the timely and effective response to disaster.	Assam State Disaster Management Authority (ASDMA)	EPC Contractor / PMC / AEGCL
32.	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.	Inspectorate of Electricity (IEC), Assam	EPC Contractor / PMC / AEGCL
33.	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 to the design and construction of substation buildings and associated infrastructures	Approval building plan from appropriate agency	EPC Contractor / PMC / AEGCL
34.	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 subproject construction activities.	Central Ground Water Board (CGWB)	EPC Contractor / PMC / AEGCL
Social Regulations					
1.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 The Assam Land (Requisition and Acquisition) Act, 1964	The RFCTLARR Act,2013 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. The mandate of the Assam Land (Requisition and Acquisition) Act, 1964 is to provide the legal framework for the State Government to temporarily requisition or permanently acquire immovable property for public	Applicable: Although the lands for both proposed subprojects were acquired through negotiated settlement with private tea estate owners, the compensation was determined in accordance with the provisions of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR Act, 2013).	State Revenue Department/ District Administration	AEGCL

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
		purposes. It outlines the procedures for serving notice to affected parties, determining compensation, and ensuring that once acquired, the land vests in the State free from all encumbrances. This framework enables the State to meet essential infrastructure and public welfare needs while ensuring lawful compensation to landowners. Section 3(1) empowers the State Government to requisition private land for specified public purposes with due notice to the owner or tenant, while Section 6(1) allows the State to permanently acquire such requisitioned land through a Gazette notification, after which it vests in the State free of encumbrances.	The ALRA Act, 1964 was applied to facilitate the transfer of tea estate land to AEGCL for public purpose.		
2.	Rights of Persons with Disabilities Act, 2016	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.	Applicable. For the proposed subproject where Persons with Disabilities are present and affected.	Ministry of Social Justice & Empowerment/ Commissionerate of Labour, Government of Assam	EPC Contractor / PMC / AEGCL
3.	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 authorities, in order to promote transparency and accountability in the working of every public authority, contain corruption.	The subproject activities come under the preview of Right to Information Act and any citizen can obtained any information about any aspect of the proposed subproject. All documents pertaining to the subproject would be disclosed to public.	Directorate of Economics and Statistics, Government of Assam	EPC Contractor / PMC / AEGCL
4.	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	Not Applicable, no notified forest land within the subproject area.	Department of Environment and Forest, Assam and District Administration	-

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
		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.			
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.	Not Applicable	Revenue & Disaster Management (LR) Department, Govt. of Assam	-
6.	The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	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.	Not applicable. No notified Archaeological site is located within 300m of the sub project.	Archaeological Survey of 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	Not Applicable. Both the proposed areas do not fall within a Schedule-6 district.	District Autonomous council	-

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
		have some legislative, judicial, and administrative autonomy within a state[4]			
	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) Act, 1996	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	EPC Contractor/PMC /AEGCL
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	EPC Contractor/PMC /AEGCL
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	EPC Contractor/PMC /AEGCL
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.	Applicable to ensure that 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	EPC Contractor/PMC /AEGCL
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. If women workers at project workplaces are engaged. It will safeguard and protect women involved in the project from Sexual Harassment. Should adhere as per the requirement of the Act.	District Administration	EPC Contractor/PMC /AEGCL

[4] *https://www.mea.gov.in/Images/pdf1/S6.pdf*

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
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. Should comply as per the requirement of the Act.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
7.	Minimum Wages Act, 1948 along with Central Rules, 1950 The minimum wages rules Assam 1952	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 and should comply minimum wages act.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
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. Contractor should adhere the both Gratuity Act and Rules.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
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	EPC Contractor/PMC /AEGCL
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 subproject. Contractor should follow as per the requirement of the Act.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
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	EPC Contractor/PMC /AEGCL

Sl. No	Relevant Acts and Policies of GoI and GoA	Mandate of the Act/Policy	Applicability	Competent Authority	Responsibility / Supervision / Monitoring
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	EPC Contractor/PMC /AEGCL
13.	National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	NIOSH has laid down criteria for a recommended standard for occupational noise exposure. The standard is a combination of noise exposure levels and duration that no worker exposure shall equal or exceed.	Applicable, contractors are required to provide hearing-protection equipment and ensure exposures of workers to noise-generating activities are within allowed NIOSH standards.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
14.	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 construction under the subproject.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
15.	Equal Remuneration Act, 1976 along with allied Rules	An Act to provide for the payment of equal 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.	Applicable because contractor shall be applying large number of labours during construction which will include both Men and Women. Compliance of regulations required.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL
16.	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. Contractor should comply if migration labours are engaged in construction work.	Commissionerate of Labour, Government of Assam	EPC Contractor/PMC /AEGCL

3.3 International Conventions and Treaties relevance to the project

India is a signatory to several international environmental conventions and treaties that aim to protect biodiversity, regulate hazardous substances, mitigate climate change, and promote sustainable development. Although these conventions are primarily applicable at the national policy level, their underlying principles are reflected in India's domestic environmental laws, guidelines, and standards. For power infrastructure projects relevance is typically assessed in terms of potential impacts on biodiversity, handling of hazardous materials (e.g., transformer oil), and broader environmental safeguards.

The table below presents a list of selected international treaties and conventions to which India is a party, along with their specific applicability or relevance to the proposed subprojects.

Table 8 : International Environment Conventions and Traties

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, flyway involved but specific bird routes/wintering sites not identified yet in Assam.
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 Aggrement)	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 in circuit breakers.
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 9.**

Table 9 : 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.

3.4 AIIB's Environmental & Social Policies/Directives[5&6]

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

A. Environmental and Social Standards (ESSs): These 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

[5] *https://www.aiib.org/en/policies-strategies/_download/environment-framework/AIIB-Revised-Environmental-and-Social-Framework-ESF-May-2021-final.pdf*
[6] *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*

given in **Table 10,** 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 10 : Environmental and Social Standards of AIIB

Environmental and Social Standards (AIIB)	Objective & Brief Description
ESS-1: 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 Agrrement 2015, Biodiversity Assessment, Project-level GRMs, Labor Management Relations etc.) to be carried out for any project to be financed by the Bank. The ESS-1 also requires compliance with the AIIB's provisions on Child Labor and Forced Labor, which prohibit employment of children under 16 years in any project activity and allow employment of 16–18-year-olds only under strict conditions, including risk assessment, non-hazardous task assignment, and protection of education and safety. ESS-1 is applicable to the project as civil works may cause a limited number of potentially adverse environmental and social impacts. These impacts are not unprecedented and are limited to the project area confined in the existing boundary.
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. For the proposed substations at Titabor (Jorhat) and Chabua (Dibrugarh), ESS 2: *Involuntary Resettlement* is considered applicable. In both cases, land was transferred to AEGCL through a negotiated settlement with private tea estate authorities (Letekujan Tea Estate for Titabor and Chabua Tea Estate for Chabua) with involvement by the respective district administrations. The transferred land parcels, measuring 1.21 hectares at Titabor (within a total grant area of 303.61 hectares, of which 229.80 hectares are under tea plantation) and 3.62 hectares at Chabua (within a total grant area of 1,309.76 hectares, of which 760.42 hectares are under tea plantation), were portions of operational tea estates not used for housing, worker settlements, critical infrastructure or informal users. The transactions caused no physical or economic displacement, nor any loss of access to livelihoods, communal facilities, or cultural. The estates retain sufficient unplanted grant areas to

Environmental and Social Standards (AIIB)	Objective & Brief Description
	maintain their agricultural operations, and the compensation received is being reinvested in tea plantation and land adjustment within the gardens. Letekujan Tea Estate employs 312 permanent workers (92 male, 220 female) and 250 seasonal workers (80 male, 170 female), while Chabua Tea Estate employs 1,666 permanent workers (710 male, 956 female) and 1,200 seasonal workers (550 male, 650 female). In both cases, the tea estate authorities have provided confirmation that there will be no impact on workers' employment, housing, or access to facilities as a result of the substation construction.
ESS-3: 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 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. ESS-3 is also not expected to be triggered. Site visits, public consultations, and stakeholder engagement confirmed that no indigenous communities or Scheduled Tribe populations reside in or around the proposed substation locations. Therefore, the project does not pose any direct or indirect impact on indigenous peoples or their lands, cultural resources, or livelihoods.

B. 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[7]; or (b) involves activities or items specified in the list set forth in the Environmental and Social Exclusion List (**Appendix 9**).

C. Project categorization: The project has been assigned as "Category "B" by AIIB in accordance with the ESP on the basis that the project environmental and social (E&S) risks and impacts are site-specific, temporary and can be mitigated through standard E&S management practices. This ESIA-ESMP will set out the measures to mitigate the subproject's E&S risks and impacts in a manner consistent with AIIB's ESP and ESSs. Rapid Environmental and Social Assessment (RESA) Checklists for each sub-station are attached as **Appendix-1** and **Appendix-2** which

[7] *Forced eviction is defined as the permanent or temporary removal, against the will of individuals, families and/or communities, from homes or land (or both) which they occupy, without the provision of, or access to, appropriate forms of legal or other protection (such as the provisions of ESS 2: Involuntary Resettlement). The exercise of eminent domain, compulsory acquisition or similar powers, is not considered to be forced eviction, providing it complies with the requirements of national law and the provisions of ESS 2: Involuntary Resettlement, and is conducted in a manner consistent with basic principles of due process (including provision of adequate advance notice, meaningful opportunities to lodge grievances and appeal, and avoidance of the use of unnecessary, disproportionate or excessive force).*

served as a tool to preliminarily identify and evaluate potential environmental and social risks and sensitivities associated with the both proposed subprojects.

3.5 Gap Analysis between National and AIIB Policies and Standards

Following gaps has been identified:

- Power Substation and Transmission Line Construction Projects are not classified as environmentally sensitive projects under the EIA Notification, 2006, and are categorized as B2, which does not require an Environmental Impact Assessment (EIA) under Indian regulations. However, according to the Environmental and Social Framework (ESF) of AIIB, power transmission projects may have potential adverse environmental and social impacts and are typically classified as Category B. Consequently, these projects require the preparation of ESIA-ESMP report.
- As per national regulations, the analysis of project alternatives is not mandatory for power substation and transmission line construction projects. However, in accordance with AIIB's guidelines, an alternatives analysis is a mandatory requirement and must be included as part of the project's environmental and social assessment.
- As per the GoI and GoA guidelines, the preparation of an Environmental and Social Management Plan (ESMP) and allocation of a corresponding budget are not mandatory for power substation and transmission line construction projects. However, as per AIIB's guidelines, both the development of a comprehensive ESMP and provision for budget allocation are required to ensure effective implementation of environmental and social mitigation measures.
- Under national regulations, public consultation is not required for power substation and transmission line construction projects, and the EIA Notification does not mandate the establishment of a grievance redress mechanism. In contrast, AIIB guidelines require meaningful public consultation and the establishment of a grievance redress mechanism to receive and address concerns or complaints from affected stakeholders.
- Under Indian regulations, public disclosure of information is not mandatory for power substation and transmission line construction projects. However, AIIB guidelines require timely and transparent disclosure of environmental and social information to stakeholders as part of the project preparation and implementation process.
- There are no specific national guidelines prescribing minimum environmental standards for power substation and transmission line construction projects. However, the IFC Environmental, Health, and Safety (EHS) Guidelines for Electric Power Transmission establish clear minimum standards for air, water, noise, and soil quality, which should be adhered to in the planning and implementation of such projects.
- National regulations do not provide for compensation to all displaced persons, particularly those without legal titles, such as individuals occupying government land. In contrast, AIIB requires that all affected persons regardless of legal ownership or title status—be compensated and assisted as part of its social safeguard policies.
- Under national regulation, the Child Labour (Prohibition & Regulation) Act, 1986 (as amended) prohibits employment of children below 14 years and restricts adolescents (14–18 years) from hazardous work. AIIB's ESF sets a higher standard by prohibiting employment below 16 years and permitting engagement of 16–18-year-olds only under strict conditions, including risk assessment, assignment to non-hazardous tasks, and protection of education and safety. Accordingly, project compliance will align with the stricter AIIB standard.

- Under Indian standards, power substation and transmission line construction projects are not subject to mandatory environmental and social monitoring and reporting requirements. However, AIIB guidelines stipulate that such projects must include regular monitoring and reporting as part of the environmental and social management process.

3.6 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)[8]. 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[9] serves as a testament to its dedication to fulfilling E&S responsibilities, including occupational health and safety.

[8] *https://www.powergrid.in/sites/default/files/inline-files/ESPPF_ASSAM.pdf*
[9] *https://www.aegcl.co.in/wp-content/uploads/2020/12/Safety_Manual_AEGCL.pdf*

Chapter 4: Description of Environmental & Social Baseline Conditions

This chapter presents the existing environmental and social conditions of both subproject locations. The assessment is based on data collected through a combination of primary and secondary sources, including literature reviews, site visits, stakeholder consultations, and field data collection. In addition, remote sensing techniques and GIS-based mapping have been employed to analyze and visualize the current conditions of the subproject areas.

The baseline assessment provides a comprehensive understanding of the physical, biological, and social environment within the study area. This information serves as a foundation for evaluating potential impacts and ensuring informed decision-making.

4.1 Study Area

To establish the baseline and assess potential impacts, a defined zone around the subproject sites has been considered for evaluating the environmental and social baseline as well as the ecological and biological environment. While direct impacts will be limited to the project footprint area, indirect and induced impacts extend to the Project's Area of Influence (AoI), as described below.

- **Project Footprint Area:** Refers to the selected area of 1.21 Ha and 3.62 Ha covering entire area of the proposed substation, the **132/33 kV (2X50 MVA) GIS at Titabor** and the **132/33 kV (2X50 MVA) AIS at Chabua** will be constructed respectively.
- **Project Area of Influence (AoI):** Includes areas affected by potential indirect and induced impacts from subproject activities. A 2 km buffer zone has been identified for environmental and social baseline assessments, while a 10 km buffer zone has been designated for evaluating the ecological and biological environment.
- Additionally, sensitive receptors such as schools, hospitals, religious structures, and settlements have been specifically mapped within a 500-meter radius of each substation site to identify site-specific environmental and social risks.

Toposheet maps illustrating the 2 km buffer zone around the proposed substation locations are provided in **Figure 5** and **Figure 6.**

4.2. Physical Environment Baseline of the Study Area

4.2.1 Physiography and Terrain

The proposed substations are located in Jorhat and Dibrugarh districts of Assam, both situated within the Brahmaputra Valley, a region characterized by predominantly flat to gently undulating terrain, active floodplains, stable alluvial terraces, and transitional hill zones. Despite their geographical proximity and shared placement along the southern bank of the Brahmaputra River, the two districts exhibit distinct physiographic features shaped by their hydrological systems and topographic variation.

Both districts lie within the upper Assam foreland basin, with general elevations ranging from 97 meters to 474 meters above mean sea level (msl). The natural slope trends from southeast to northwest in Jorhat and towards the southwest in Dibrugarh, following the flow direction of the Brahmaputra and its major tributaries, such as the Burhi Dihing, Subansiri, and Sesa Nala.

In Jorhat, the landscape can be broadly divided into two physiographic zones: a flooded belt along the southern bank of the Brahmaputra, spanning 4 to 12 kilometers in width, characterized by seasonal inundation, natural drainage channels, and swampy lowlands; and a central alluvial plain extending towards the foothills of Nagaland, comprising largely flat, agriculturally productive land. Small hill ranges occur in the southern and southeastern parts, representing the northern fringe of the Naga Hills.

In Dibrugarh, the physiography is defined by a combination of low-lying Brahmaputra floodplains, marked by depositional features like sandbars (*Chars*), abandoned channels, and swamps, and a southeastern highland zone consisting of older alluvial terraces and isolated hill ranges. The elevation here ranges from 97 m to 108 m in the floodplain areas and rises up to 500 m at Tikak Parbat, with a regional hill alignment trending northeast to southwest.

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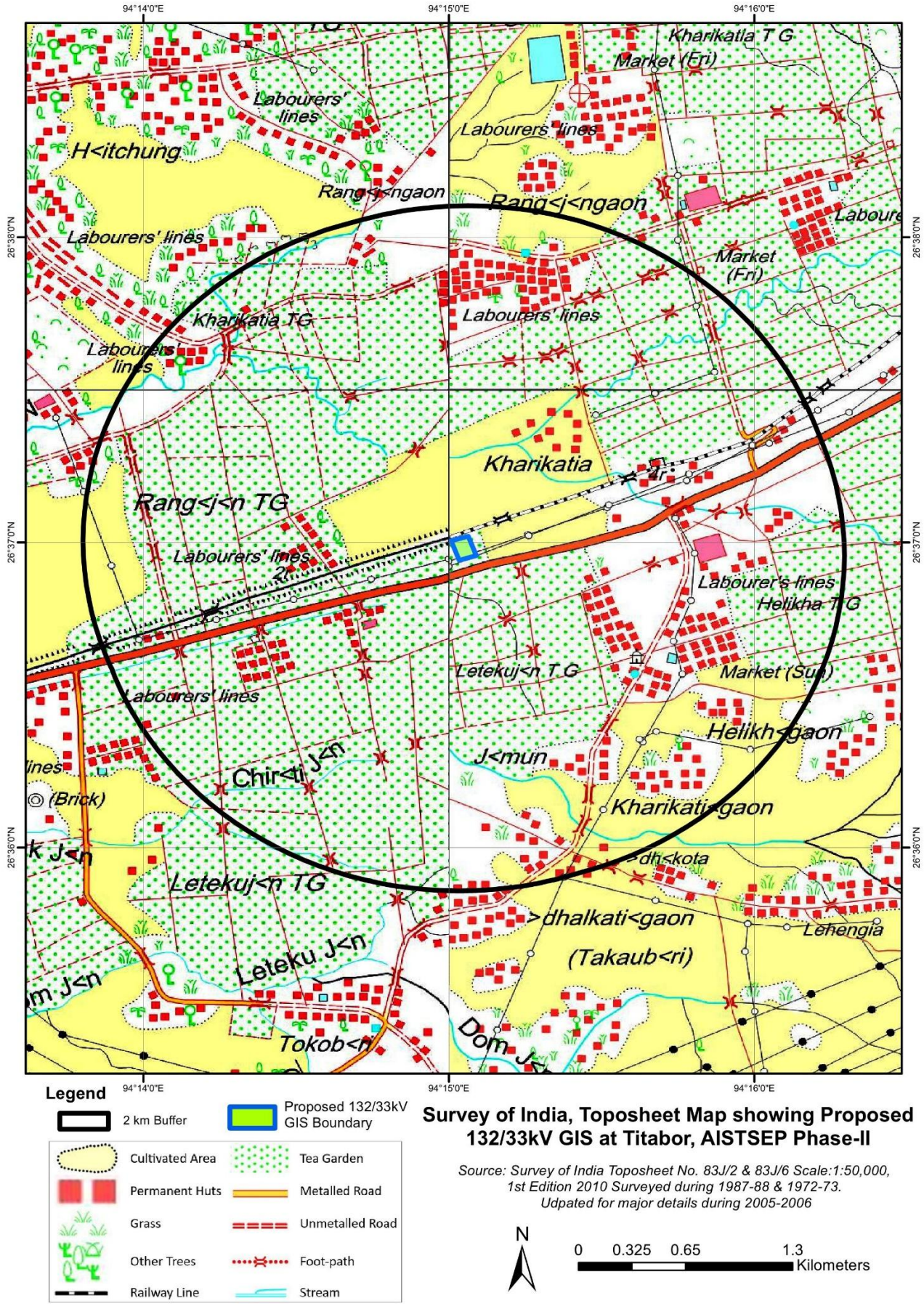

Figure 5 : SoI Toposheet showing Proposed 132/33 kV (2X50 MVA) GIS at Titabor, AISTSEP, Phase-II

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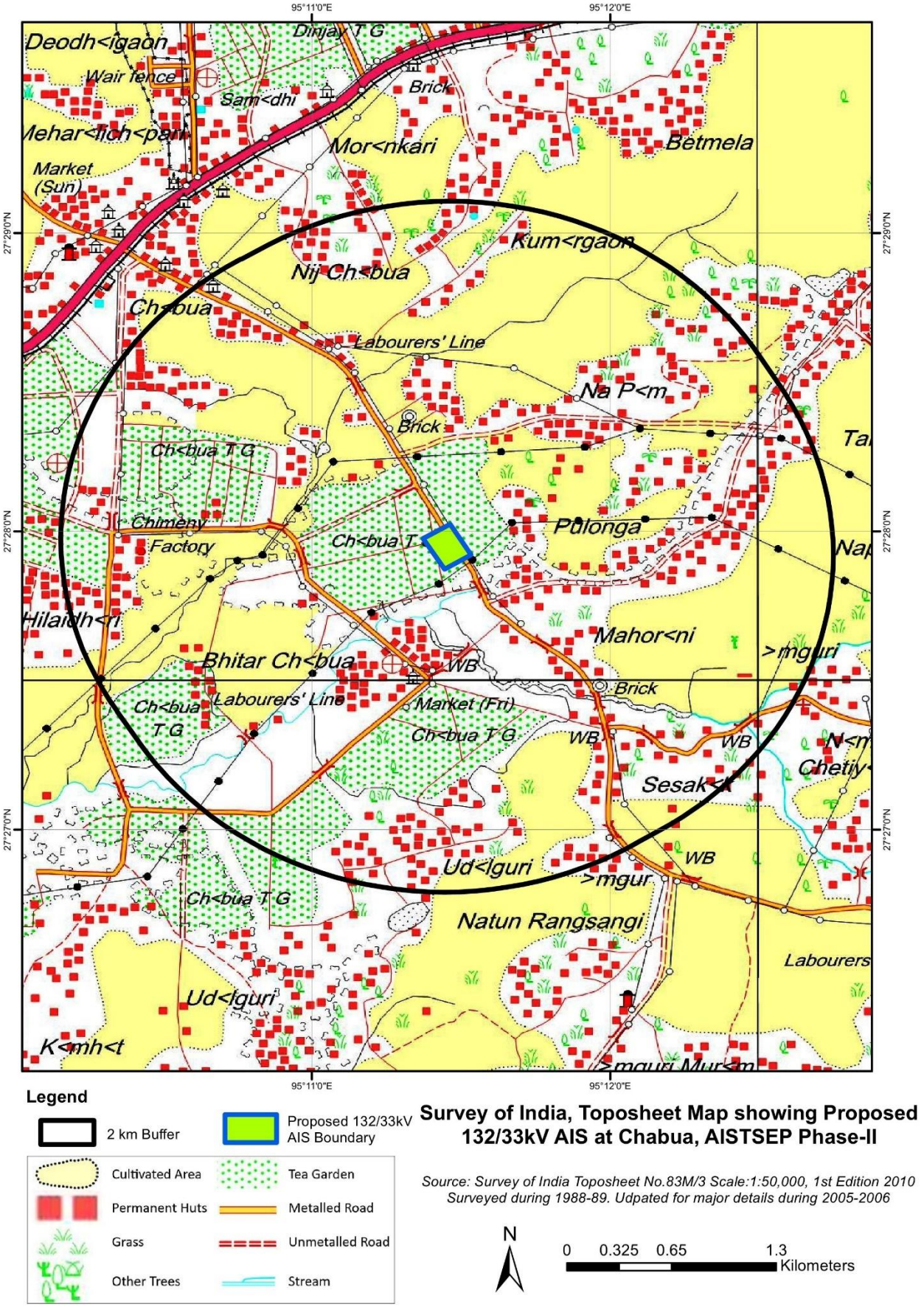

Figure 6 : SoI Toposheet showing Proposed 132/33 kV (2X50 MVA) AIS at Chabua, AISTSEP, Phase-II

4.2.2 Geology and Soil type

The soils of both Jorhat and Dibrugarh districts, located in Upper Assam, share several characteristics due to their common setting within the Brahmaputra floodplain. The predominant soil types in these districts have formed through alluvial deposition processes over time and exhibit variations in texture, acidity, and nutrient content, depending on topography and land use.

In Jorhat district, soils are largely acidic in nature, with widespread micronutrient deficiencies, particularly in agricultural belts. Seasonal flooding, sand deposition, and soil erosion have influenced the fertility and structure of the soils in many parts of the district. The dominant soil type is sandy loam, which accounts for 58.25% of the total soil coverage. Other major soil textures include silty clay loam (15.40%), sandy (9.92%), loamy (8.17%), and clay (8.26%).

In Dibrugarh district, the soil profile is closely shaped by its underlying physiographic features, which include the expansive floodplains of the Brahmaputra River and the terrace deposits interspersed with denudational hills in the southern region. The floodplain soils are predominantly grayish in color and range in texture from sandy to clayey loam. These soils are generally acidic in reaction, with a pH range of 4.6 to 5.9, and are characterized by low to medium phosphate levels and medium to high potash content. Based on their pedogenic origin and profile development, the soils of the district are classified into three major categories: Entisols (recent riverine alluvial soils), Inceptisols (older riverine alluvial soils), and Alfisols (older mountain valley alluvial soils). Among these, the clay loam texture dominates the district, covering approximately 76.59% of the total area. This is followed by clay soils (8.78%), sandy soils (7.60%), and sandy loam soils (7.03%), indicating moderate variability in soil types across the landscape, which in turn influences land use suitability and infrastructure planning.

Table 11 : Soil Profile of Jorhat and Dibrugarh Districts

Jorhat District	
Soil Type	**District Coverage (%)**
Sandy Loam	58.25%
Silty Clay Loam	15.40%
Sandy	9.92%
Loamy	8.17%
Clay	8.26%

Dibrugarh District	
Soil Type	**District Coverage (%)**
Clay Loam	76.59%
Clay	8.78%
Sandy	7.60%
Sandy Loam	7.03%

Source: District Irrigation Plans of Jorhat and Dibrugarh, Assam

4.2.3 Climate, Temperature and Rainfall Pattern

The climatic characteristics of the proposed subproject locations, 132/33 kV GIS at Titabor in Jorhat district and 132/33 kV AIS at Chabua in Dibrugarh district, reflect the broader humid subtropical monsoon climate of the upper Brahmaputra valley region in Assam. Both districts experience distinct wet and dry seasons, high relative humidity, and moderate to extreme rainfall events due to their geographic location and exposure to seasonal wind patterns, and the influence of the Bay of Bengal.

A. Jorhat District (132/33 kV GIS at Titabor)

Jorhat district has a subtropical monsoon climate, marked by hot and humid summers, a prominent monsoon season, and cool to mild winters. Relative humidity remains high throughout the year, with generally light winds. However, cyclonic storms and depressions originating from the Bay of Bengal occasionally impact the area during the monsoon and post-monsoon months, often resulting in heavy downpours.

- **Temperature:**
  - Maximum recorded: ~42°C
  - Minimum recorded: ~8°C

Temperature begins rising in late February, peaking during July and August, and then gradually falls from November. January is the coldest month, often with fog. Thunderstorms are common between March and May.

- **Rainfall:**
  The rainfall regime (2018–2022) shows a dry season from November to February, followed by pre-monsoon showers from March to May, peaking in May.

  - May 2019 recorded the highest pre-monsoon rainfall (354.9 mm), followed by 320.6 mm in 2020 and 281.3 mm in 2022.
  - The monsoon season (June–September) contributes most of the annual rainfall, with June 2020 recording 504.7 mm and July 2020 recording 448.3 mm.
  - 2022 had one of the highest annual rainfalls (2113.2 mm), while 2021 had significantly less (1470.4 mm).

This variability highlights climatic sensitivity to both flood risks and moisture stress, emphasizing the need for resilient infrastructure. The rainfall distribution of Jorhat district is presented in **Table 12** and **Figure 7.**

Table 12: Rainfall Distribution in Jorhat District (in mm), Assam

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
2018	3.9	29.2	98.3	112.8	157.3	374.9	313	309.7	277.8	25.5	28.5	33.8
2019	6.8	33.1	70.6	132.4	354.9	269.6	366.1	209.9	347.5	155.4	6.3	13.2
2020	40.5	19.2	18.6	80.4	320.6	504.7	448.3	264.1	202.6	146.9	34.9	1.7
2021	4.9	0.9	36.1	43.3	271.8	314.3	239.8	284	144.3	97.3	20.3	13.4
2022	23.7	62.4	48.6	307.1	281.3	340	345	171.3	285.6	239	0	9.2

***Source**: Customized Rainfall Information System (CRIS), Hydromet Division, IMD, Ministry of Earth Sciences, GoI*

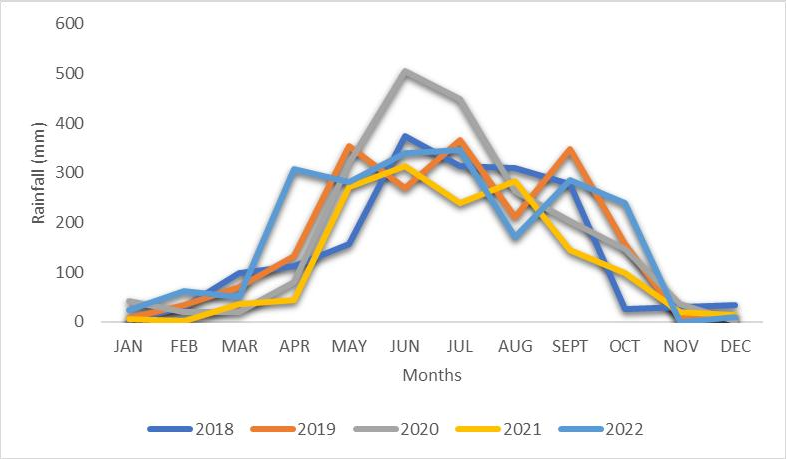

Figure 7: Rainfall Distribution in Jorhat District, Assam

B. Dibrugarh District (132/33 kV AIS at Chabua)

The climate of Dibrugarh district is humid subtropical, typical of the Brahmaputra valley. Winters span from November to February, followed by a short spring (March–April), and then the onset of pre-monsoon showers in April. The southwest monsoon generally sets in by May and lasts till mid-October.

- **Temperature:**
  - Mean maximum: ~27.3°C
  - Mean minimum: ~18.4°C

The region experiences mild winters and humid, warm summers, with seasonal thunderstorms in the pre-monsoon period.

- **Rainfall:**
  Based on 5-year data (2018–2022), Dibrugarh has a similar seasonal rainfall pattern to Jorhat but with generally higher totals.
  - May month consistently receives significant pre-monsoon rain, peaking at 479.4 mm in 2019.
  - June and July months are typically the rainiest, with June 2020 recording 563.6 mm and July 2019 peaking at 555.3 mm.
  - August and September months also receive substantial rainfall, with August 2021 at 354.1 mm and September 2019 at 302.4 mm.
  - The wettest year was 2022 with an annual total of 2487.7 mm, while 2021 recorded the lowest at 1581.3 mm.

These trends highlight interannual fluctuations and the district's vulnerability to extreme rainfall events, warranting robust flood control, stormwater drainage, and adaptive infrastructure planning. The rainfall distribution of Dibrugarh district is presented in **Table 13** and **Figure 8**.

Table 13 : Rainfall Distribution in Dibrugarh District (in mm), Assam

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
2018	16.3	24.1	151	119.2	193.2	376.5	431.8	304.1	245.1	63.3	37	26.9
2019	15	56.4	71.5	151.4	479.4	293.3	555.3	169.8	302.4	118.5	5.9	3.8
2020	39	35.9	36.7	114.4	326.1	563.6	433.9	271.5	249.1	186.1	35	0
2021	14.3	2.5	42.2	69.7	290.1	371.4	241.5	354.1	136.8	67.2	8.8	20.6
2022	31.5	60.3	60.4	409.5	304.4	515	339.2	276.2	237	226	0	17.9

***Source**: Customized Rainfall Information System (CRIS), Hydromet Division, IMD, Ministry of Earth Sciences, GoI*

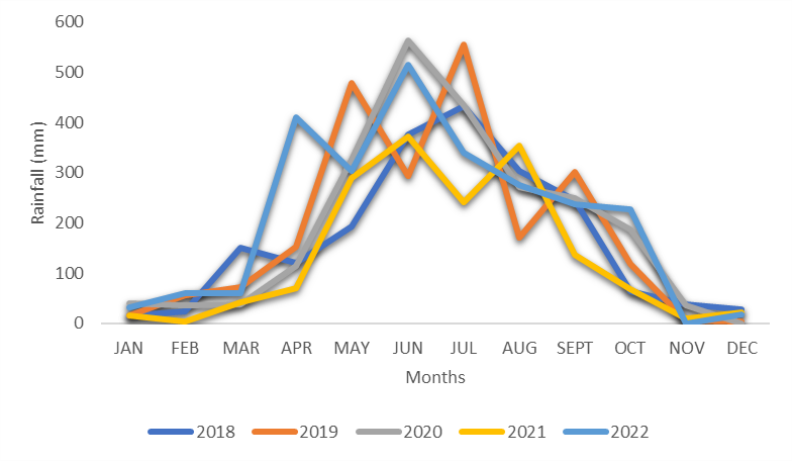

Figure 8: Rainfall Distribution in Dibrugarh District, Assam

4.2.4 Land use pattern

The land use and land cover (LULC) characteristics of Jorhat and Dibrugarh districts reflect a predominantly agrarian landscape interspersed with forested areas, non-agricultural lands, and patches of uncultivated terrain. These patterns are shaped by the region's physiography, population distribution, economic drivers, and the extensive presence of tea gardens, an iconic feature of Upper Assam providing a vital basis for environmental planning, resource management, and infrastructure development.

In Jorhat district, agriculture is the principal land use, with the net area sown accounting for approximately 96,069 hectares, or nearly 60% of the total geographical area (160,588 ha). Forest areas, mainly found in the southern and southeastern foothills, span 25,247 hectares, contributing significantly to ecological stability and biodiversity conservation. Fallow land (12,478 ha) and uncultivated land (11,535 ha), comprising groves, miscellaneous tree crops, and unused tracts, present opportunities for land productivity enhancement through agroforestry or climate-resilient farming systems. Non-agricultural uses, including settlements, infrastructure, and built-up areas, occupy 15,259 hectares, reflecting a gradual shift towards urbanization. A breakdown of the LULC categories and their spatial extent in hectares for Jorhat district is provided in **Figure 9.**

The proposed 132/33 kV GIS site at Titabor in Jorhat district lies within a predominantly tea-growing area. The substation is located in Letekujan Tea Estate, operated by M/s Kasonjan Tea Company (P) Ltd. The surrounding area exhibits a mixed land use pattern, including tea plantations, general agricultural lands, vegetated zones, and limited built-up areas. The LULC map of the Titabor subproject site, based on Sentinel-2 satellite imagery, is presented in **Figure 11**.

LULC Type of Jorhat District	Area in Ha
Forest	25247
Non-Agri	15259
Un-cultivated	11535
Fallow	12478
Net Area Sown	96069
Total Geographical Area	**160588**

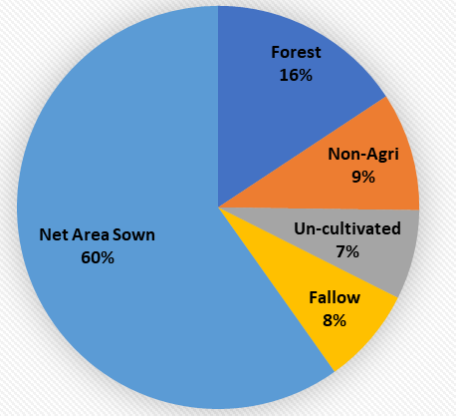

Figure 9 : Land Use classification of Jorhat District as per Statistical Handbook of Assam-2023

In Dibrugarh district, a more diversified and expansive LULC pattern is evident, spanning 338,100 hectares. The net sown area covers 150,647 hectares (approx. 44.56%), reflecting a strong agricultural base supported by fertile alluvial floodplains. Notably, non-agricultural land uses dominate 125,001 hectares (around 37%), attributable to widespread urbanization, industrial activity, and large-scale tea cultivation, which are critical to the local economy. Uncultivated land (29,133 ha) and fallow land (11,525 ha) highlight the need for sustainable land management to optimize productivity. Forest areas, totaling 21,794 hectares, are concentrated in the southeastern uplands and hill tracts, playing a vital role in watershed protection and regional climate regulation. A breakdown of the LULC categories and their spatial extent in hectares for Dibrugarh district is provided in **Figure 10.**

The proposed 132/33 kV AIS at Chabua is located within the Chabua Tea Estate, owned by Amalgamated Plantation Pvt. Ltd. The surrounding landscape demonstrates mixed land use, with tea gardens, agricultural

fields, vegetated areas, and sparse built-up zones. The LULC map of the Chabua subproject site, derived from Sentinel-2 satellite imagery, is shown in **Figure 12.**

LULC Type of Dibrugarh District	Area in Ha
Forest	21794
Non-Agri	125001
Un-cultivated	29133
Fallow	11525
Net Area Sown	150647
Total Geographical Area	**338100**

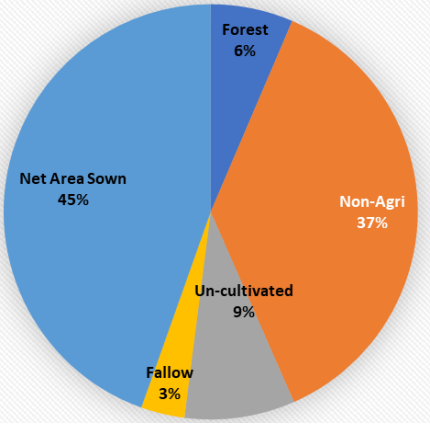

Figure 10: Land Use classification of Dibrugarh District as per Statistical Handbook of Assam-2023

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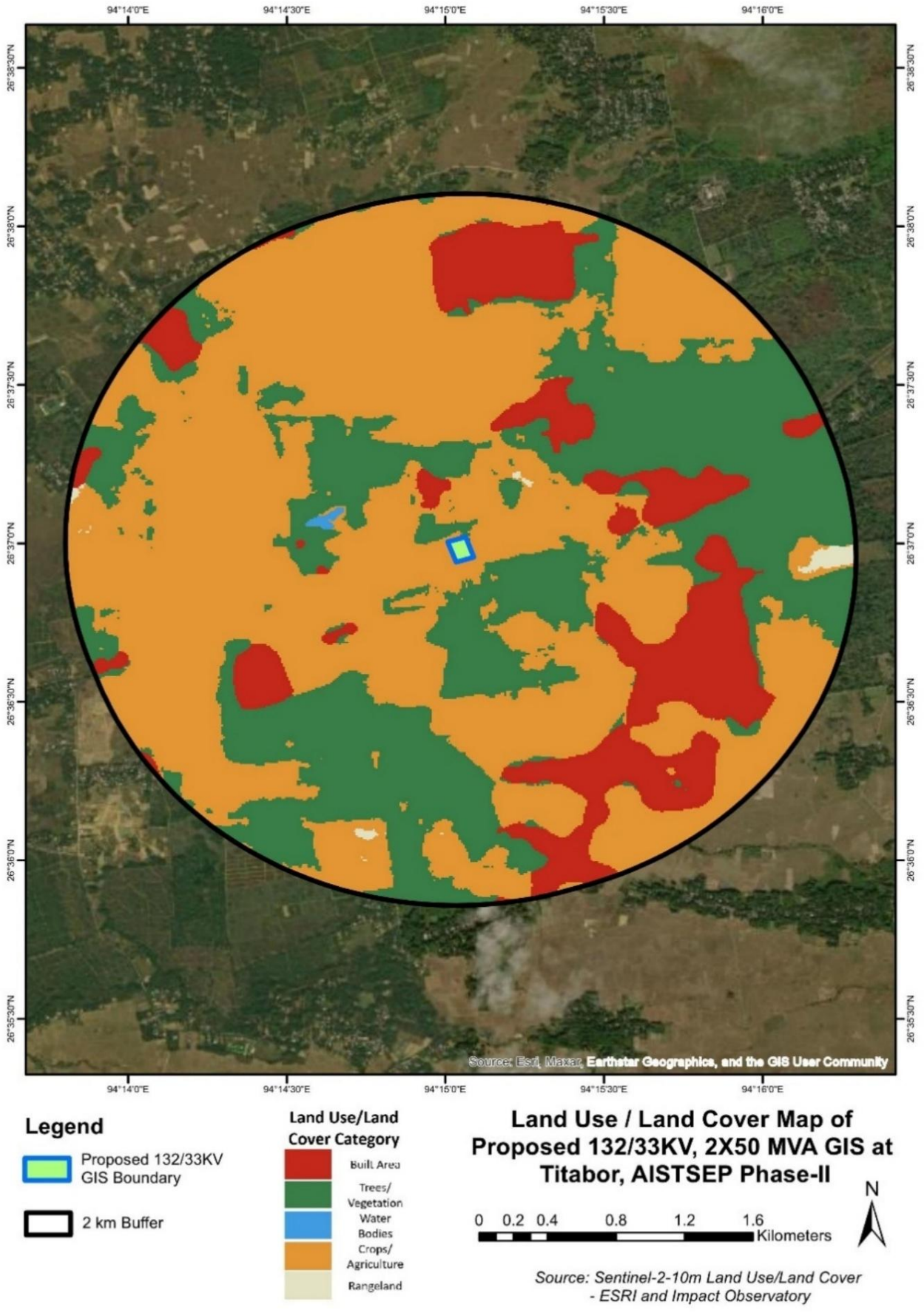

Figure 11 : Land use / Land Cover Map of the Proposed 132/33 kV GIS at Titabor

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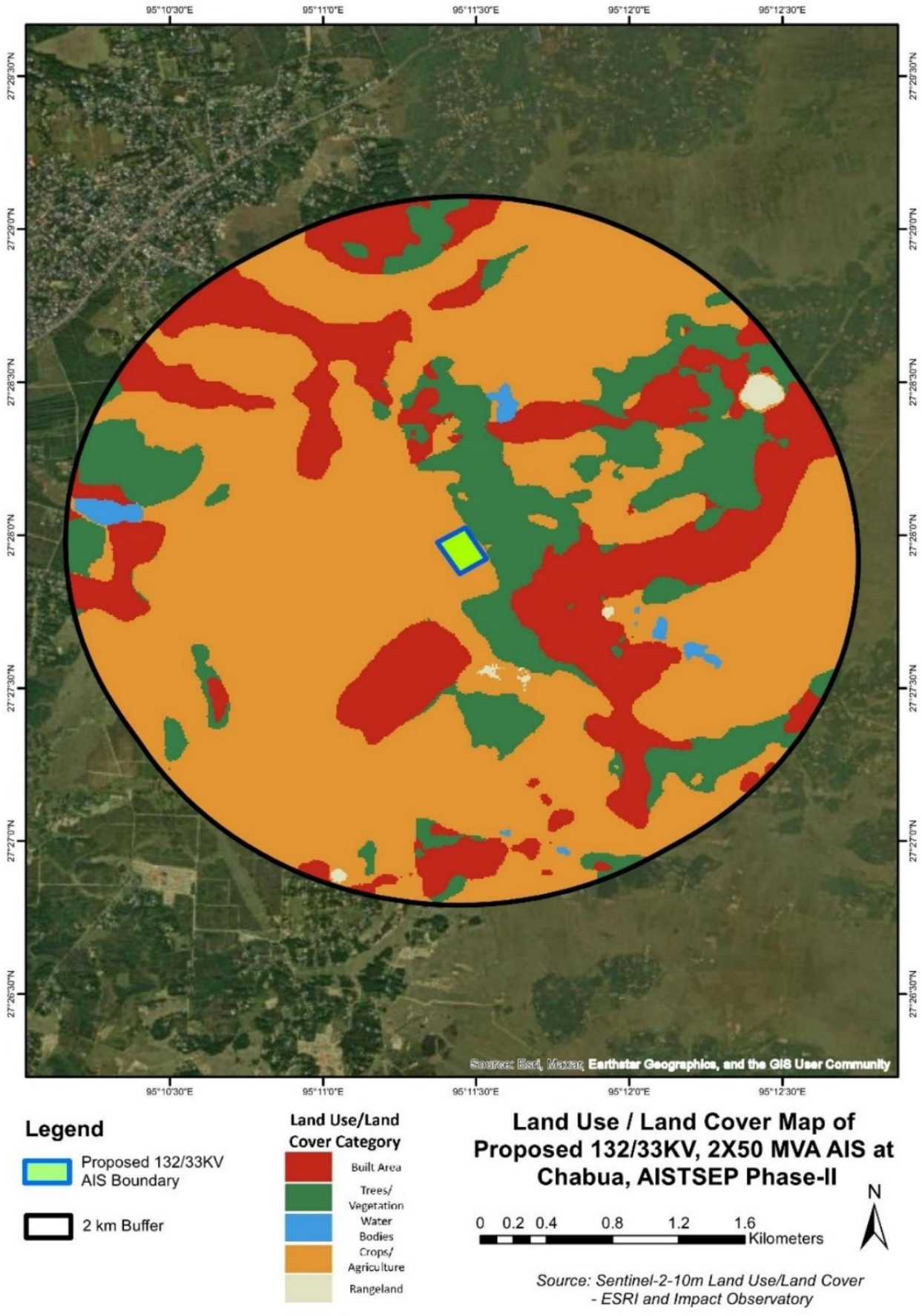

Figure 12 : Land use / Land Cover Map of the Proposed 132/33 kV AIS at Chabua

Details of the Sensitive Receptors

A detailed layout plotted on a Google Earth image has been developed to visually demarcate the both proposed 132/33 kV Titabor GIS and 132/33 kV Chabua AIS site and its immediate surroundings. This visual representation clearly outlines the substation boundary and highlights the locations of residential areas only located within a 500-meter buffer zone. This spatial mapping aids in assessing potential environmental and social impacts, ensuring that appropriate mitigation measures are integrated into project planning and implementation to safeguard nearby communities and ecological features.

Table 14: Sensitive receptors within 500 m radius of Titabor GIS site

Sl. No.	Sensitive Receptor	GPS Coordinates		Aerial Distance from Proposed 132/33kV GIS at Titabor
		From	To	
1	Residential Areas	26°36'58.90"N 94°15'10.98"E	26°37'3.97"N 94°15'14.01"E	168.17 to 295.88 m
		26°37'1.49"N 94°15'22.32"E	26°37'9.15"N 94°15'18.29"E	452.24 to 465.32 m
		26°37'7.88"N 94°15'8.84"E	26°37'16.62"N 94°15'8.72"E	272.22 to 463.74 m
		26°37'4.98"N 94°14'53.93"E	26°37'13.32"N 94°14'56.16"E	232.13 to 420.08 m

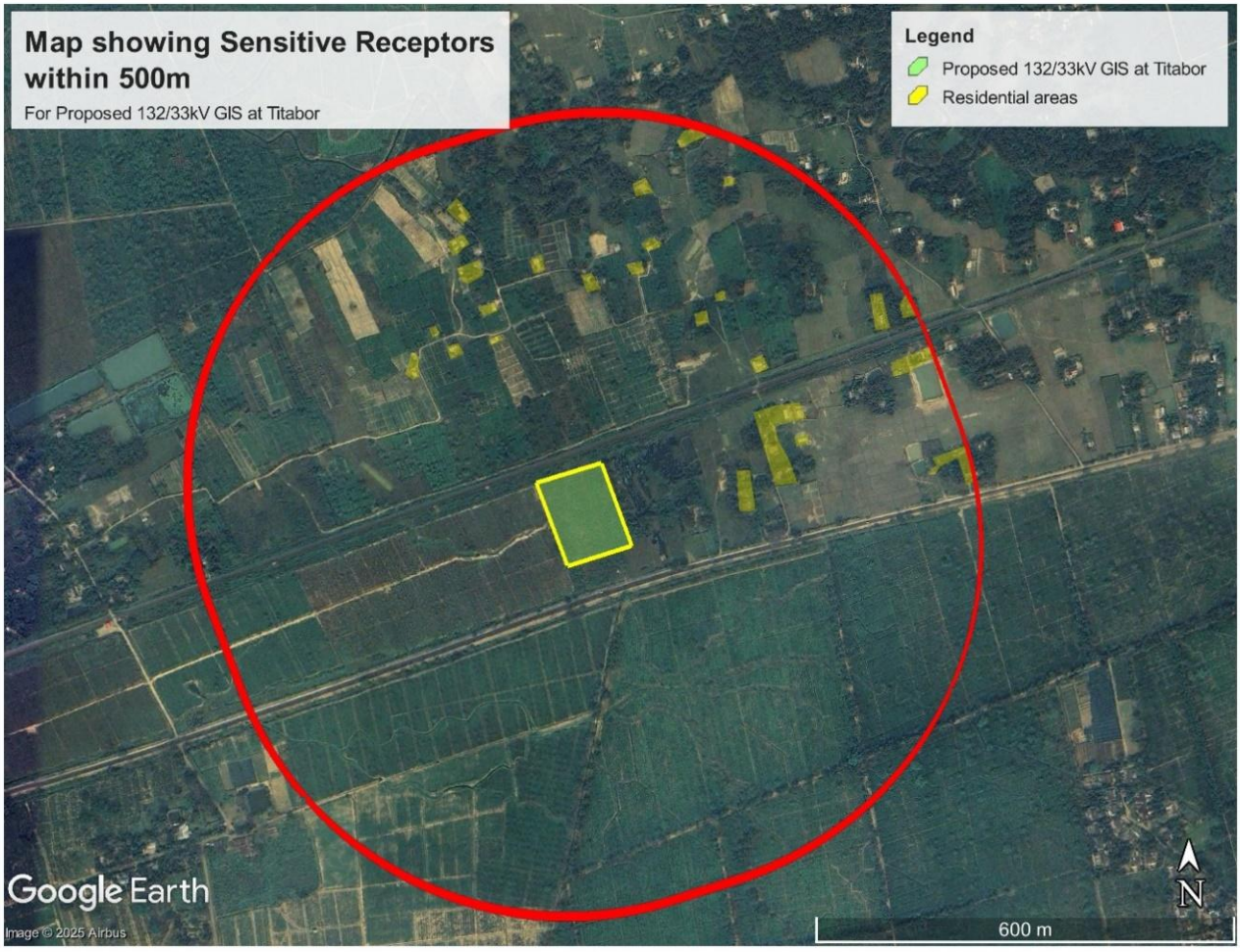

Figure 13: Map showing sensitive receptors within 500 m radius of Titabor GIS site

Photographs of residential Houses within 500m of the Proposed 132/33kV GIS at Titabor

Table 15: Sensitive receptors within 500 m radius of Chabua AIS site

Sl. No.	Sensitive Receptor	GPS Coordinates		Aerial Distance from Proposed 132/33kV AIS at Chabua
		From	To	
1	Residential Areas	27°27'48.66"N 95°11'37.98"E	27°27'42.60"N 95°11'42.56"E	266.86 to 495 m
		27°27'42.48"N 95°11'21.17"E	27°27'36.91"N 95°11'22.11"E	340.96 to 500 m
		27°27'55.70"N 95°11'43.75"E	27°28'3.31"N 95°11'47.62"E	274.25 to 499.05 m

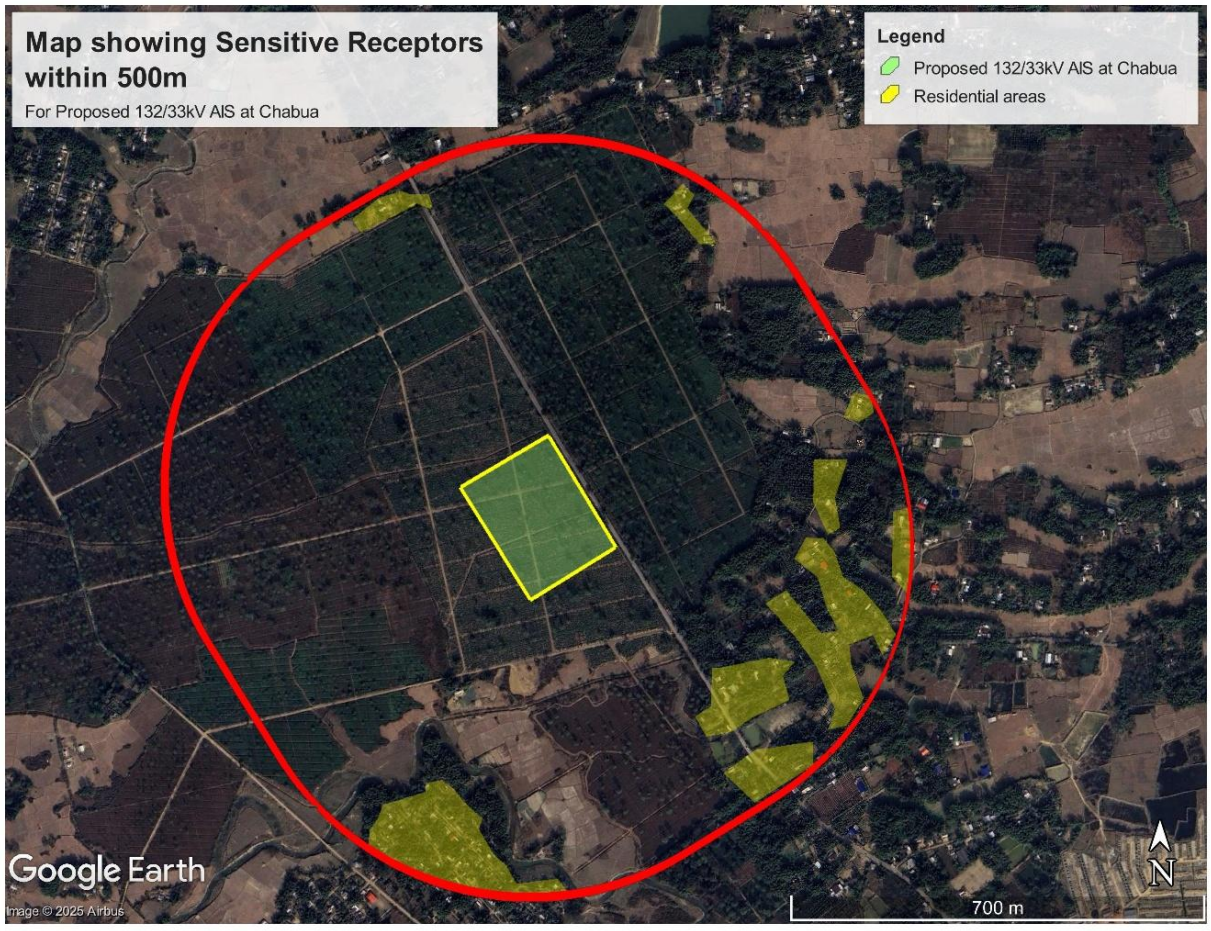

Figure 14: Map showing sensitive receptors within 500 m radius of Chabua AIS site

Photographs of residential Houses within 500m of the Proposed 132/33kV AIS at Chabua	

4.2.5 Hazards

The project sites for the proposed 132/33 kV substations at Titabor in Jorhat district and Chabua in Dibrugarh district are located in northeastern Assam, a region prone to multiple natural hazards due to its distinct geo-climatic conditions. The area frequently experiences high rainfalls, floods, and high-intensity cyclonic winds. Notably, the region falls under Seismic Zone-V, indicating a high risk of seismic activity. Earthquakes in this zone are inherently unpredictable, posing a significant challenge to infrastructure resilience and disaster preparedness.

Flood Hazard

Dibrugarh District: Flooding is a recurring hazard in Dibrugarh district, primarily governed by the Brahmaputra River and its tributaries such as Buridihing. Annual floods are triggered by Himalayan snowmelt (from March) and heavy monsoon rains (June–October). Inundation and tributary backflow particularly impact revenue circles like Chabua, Dibrugarh East/West, Tengakhat, and Moran.

In 2022, the Chabua Revenue Circle experienced floods affecting 8 villages and 8,167 people, though no human or livestock casualties were reported. Vulnerability mapping identifies 16 flood-prone villages in the circle, including Lokasoni, Niz-Rohmoria, and Borotichuk, with medium to low flood risk ratings.

However, the proposed 132/33 kV AIS substation at Chabua TE Village is not located in any identified flood-prone village and lies within a low flood hazard zone as per the Flood Hazard Map of Assam published by Assam State Disaster Management Authority (ASDMA). As per community consultations, there is no recorded history of flooding at the proposed subproject location. Local residents and stakeholders confirmed that this area has not experienced significant flood events in the past, indicating that the site is relatively safe from flood-related risks. This information supports the suitability of the selected location for the proposed substation from a flood vulnerability perspective. The site is also situated approximately 10.33 km away from the Brahmaputra River, further reducing its flood risk. The flood hazard map of Dibrugarh district with the proposed substation location in presented in **Figure 15**.

Jorhat District: The flood risk in Jorhat is comparatively lower, though localized inundation from tributaries and intense rainfall can occasionally affect low-lying areas. The proposed 132/33 kV GIS substation at Titabor has been assessed under the Flood Hazard Mapping of ASDMA, and it is also located within a low flood hazard zone, minimizing the likelihood of flood-induced disruption at the subproject site. Furthermore, community consultations revealed no recorded history of flooding at the proposed site. Local residents and stakeholders confirmed that the area has not experienced significant flood events in the past, suggesting that the site is

relatively safe from flood-related risks. The flood hazard map of Jorhat district with the proposed substation location in presented in **Figure 16**.

Earthquake Hazard

Both and Jorhat and Dibrugarh districts fall under Seismic Zone V, classified as a Very High Damage Risk Zone by the *Earthquake Hazard Map of Assam* published in the Vulnerability Atlas of India (3rd Edition) by the Building Materials and Technology Promotion Council (BMTPC), Ministry of Housing and Urban Affairs, Government of India. This denotes a high probability of severe seismic events with the potential for significant structural damage and human casualties.

The 1950 Assam earthquake, one of the most powerful in India's history, profoundly altered the geomorphology of the region, including the course of the Brahmaputra River. This event continues to underscore the seismic sensitivity of the region. Earthquake-resistant design standards must therefore be strictly followed at both Titabor and Chabua substation sites. The Earthquake Hazard Map is presented in **Figure 17**.

Wind and Storm Hazard

As per the Wind Hazard Map of Assam published in the *Vulnerability Atlas of India* (3rd Edition) by BMTPC, both Jorhat district and Dibrugarh district are classified under the Very High Damage Risk Zone-B for wind hazards. These classifications indicate the susceptibility of both areas to moderate to severe wind events, particularly during the pre-monsoon and monsoon seasons when convective storms are frequent. The Basic Wind Speed (Vb) for both locations ranges between 7 m/s and 50 m/s, highlighting the need for wind-resistant structural designs. This includes robust construction methods, proper anchoring of equipment, and secure installation of materials to minimize the risk of damage during high-wind events.The Wind Hazard Map is presented in **Figure 18**.

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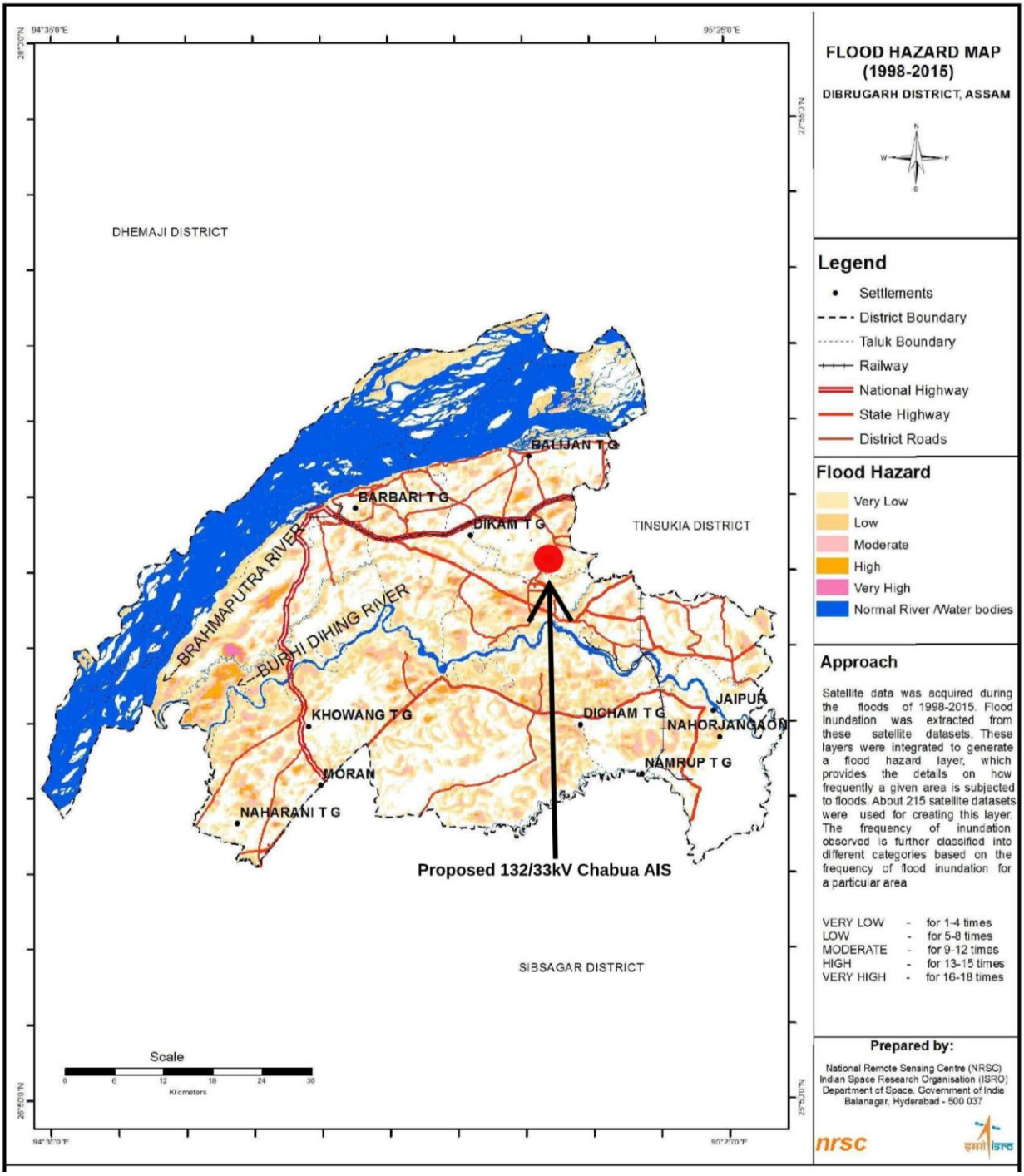

Figure 15 : Flood Hazard Map of Dibrugarh District showing 132/33kV AIS at Chabua, Assam State Disaster Management Authority, 2016

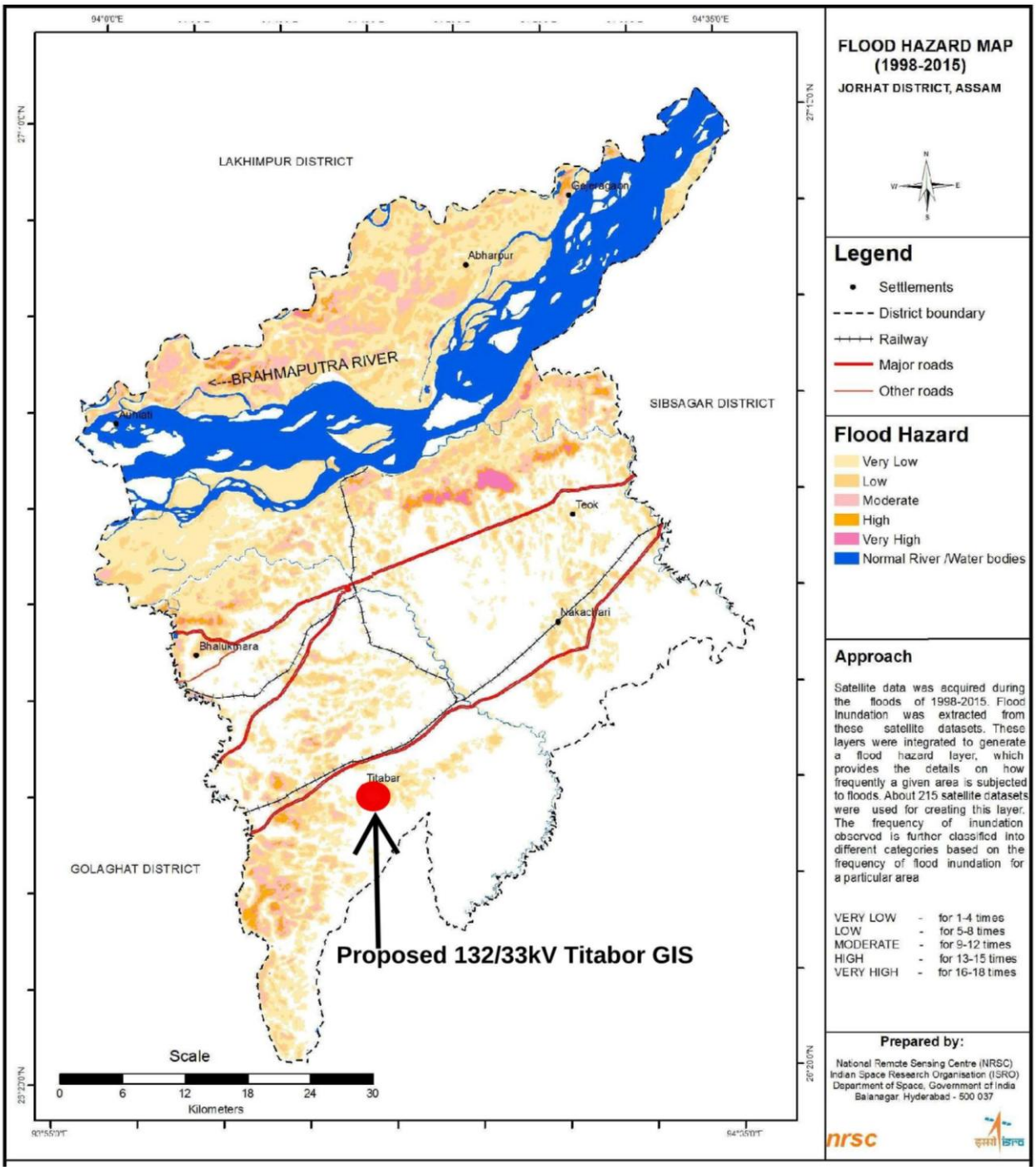

Figure 16 : Flood Hazard Map of Jorhat District showing 132/33kV GIS at Titabor, Assam State Disaster Management Authority, 2016

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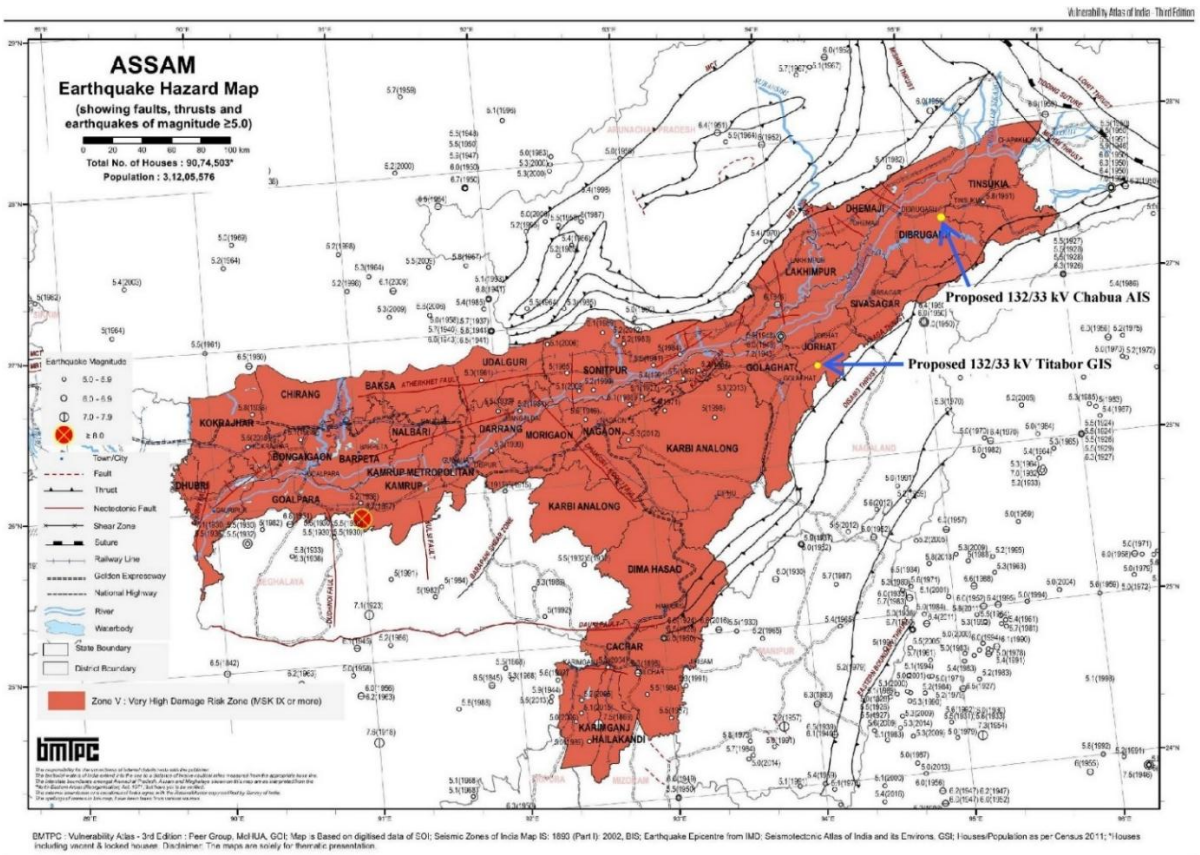

Figure 17 : Earthquake Hazard Map of Assam showing both the 132/33 kV Substations at Titabor and Chabua, BMTPC: Vulnerability Atlas - 3rd Edition

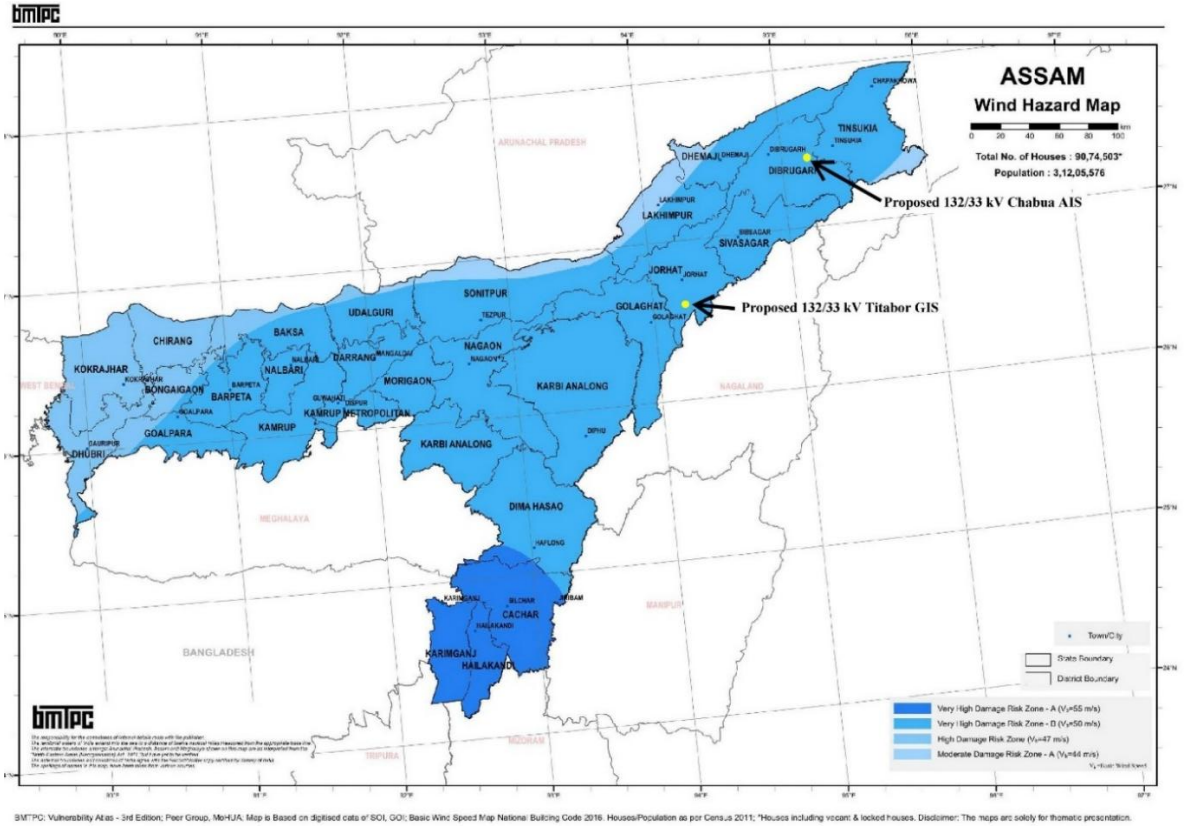

Figure 18 : Wind Hazard Map of Assam showing both the 132/33 kV Substations at Titabor and Chabua, BMTPC: Vulnerability Atlas - 3rd Edition

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4.2.6 Water Resources

A. Surface Water

Jorhat District (132/33kV GIS at Titabor): The Brahmaputra River is the principal river system draining the Jorhat district. Significant tributaries such as the Jhanji, Bhogdoi, and Kakodonga rivers originate from the Naga Hills of the Purvanchal range and traverse the district in a south-westerly direction before joining the Brahmaputra in the north. Numerous smaller streams also contribute to this well-distributed dendritic drainage network.

As per the National Wetland Atlas of Assam, Jorhat district encompasses a total wetland area of 45,979 hectares, of which rivers and streams constitute 89.12%. Other prominent wetland categories include waterlogged-natural areas (2.44%), lakes/ponds (5.05%), and oxbow lakes (1.52%). A total of 363 small wetlands (<2.25 ha) have been mapped in the district, indicating high aquatic diversity and potential ecosystem services.

A stream is located approximately 550 meters from the proposed 132/33 kV GIS site at Titabor. The wetland map of Jorhat district with the substation location is presented in **Figure 19.**

Dibrugarh district (132/33 kV AIS substation at Chabua): The district is primarily drained by the Brahmaputra River, which flows in a north-east to south-west direction across the northwestern part. Originating from the Manasarovar region in Tibet, the river enters India through Arunachal Pradesh and proceeds through Assam as a highly braided fifth-order river. In the southern portion of the district, the Burhi Dihing River, a major fourth-order tributary, flows parallel to the Brahmaputra and merges downstream. The Sesa Nala, a third-order tributary of Burhi Dihing, is notable for its pronounced sinuosity and signs of tectonic activity.

The district's hydrological landscape is defined by these major rivers, Brahmaputra, Burhi Dihing, and Mai Jan, which provide an intricate surface water regime supporting agriculture, wetlands, and local ecosystems.

According to the National Wetland Atlas of Assam, Dibrugarh district contains 72,461 hectares of wetlands, including 535 small wetlands (<2.25 ha). Wetland distribution is dominated by rivers and streams (95.43%), followed by oxbow lakes (1.79%) and lakes/ponds (590 ha across 11 mapped water bodies).

The Sesa Noi River is located approximately 281 meters from the proposed 132/33 kV AIS site at Chabua. The wetland map of Dibrugarh district showing the substation location is provided in **Figure 20.**

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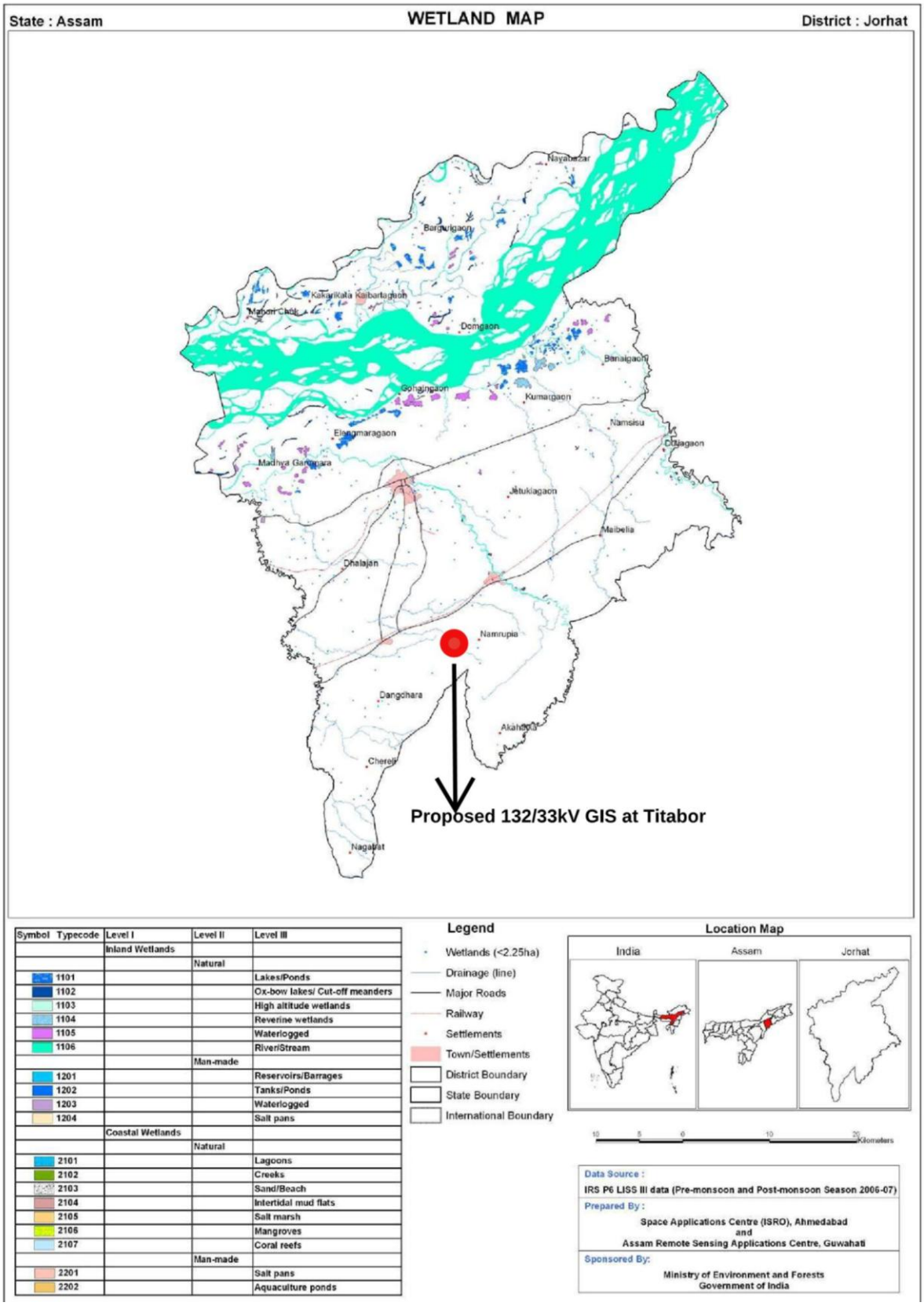
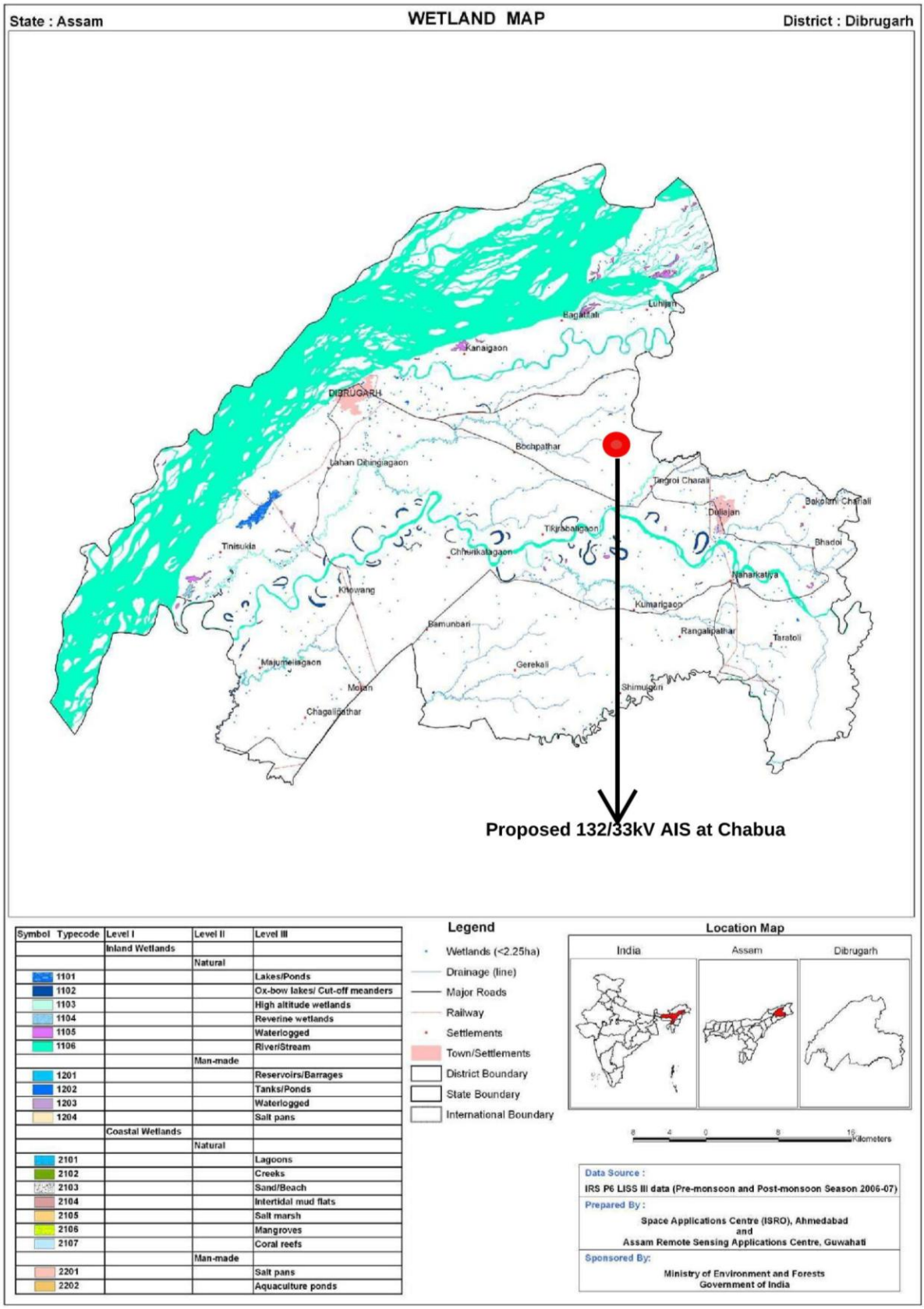


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			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 19 : Wetland Map of Jorhat District as published in National Wetland Atlas of Assam by Space Applications Centre (ISRO), Ahmedabad and Assam Remote Sensing Applications Centre, Guwahati



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 20 : Wetland Map of Dibrugarh District as published in National Wetland Atlas of Assam by Space Applications Centre (ISRO), Ahmedabad and Assam Remote Sensing Applications Centre, Guwahati

B. Ground Water

The groundwater resource assessments for Jorhat and Dibrugarh districts have been carried out based on the methodology of the Groundwater Estimation Committee (GEC), 2015, as part of the Aquifer Mapping and Management Plans (Annual Action Plan 2021–22) prepared by the Central Ground Water Board (CGWB) under the Ministry of Jal Shakti, Government of India.

These assessments offer a comprehensive understanding of groundwater recharge, extraction, and development trends at the district level. Both districts fall under the "**Safe**" category of groundwater development, indicating low anthropogenic pressure and sustainable aquifer conditions.

Both districts have abundant groundwater recharge due to high rainfall and favorable hydrogeological conditions. Dibrugarh has a higher extractable resource, reflecting a larger aquifer system and recharge area as provided in **Table 16**.

Table 16 : Recharge and Extractable Resources

Sl No.	Parameter	Jorhat District	Dibrugarh District
1	Total Annual Groundwater Recharge (ham)	93,262.30	1,32,412.60
	– Monsoon Recharge (ham)	53,640.97	83,786.19
	– Non-Monsoon Recharge (ham)	35,381.99	29,908.06
	– Recharge from Other Sources (ham)	4,239.34	Not disaggregated
2	Natural Discharge / Environmental Flow (ham)	9,326.23	13,241.25
3	Annual Extractable GW Resource (ham)	65,454.22	1,04,654.54

Despite minor differences, both Jorhat and Dibrugarh districts exhibit low levels of groundwater development, reflecting minimal anthropogenic pressure on aquifer systems. Groundwater in both districts is primarily utilized for domestic purposes, with limited extraction for irrigation and negligible industrial use. The groundwater assessment places both districts in the "**Safe**" category, with the stage of extraction well below the 70% threshold, indicating a healthy and sustainable groundwater balance.

The reliance on surface water and rainfed agriculture significantly reduces the demand for groundwater, thereby preserving aquifer sustainability. Importantly, more than 90% of the extractable groundwater resources remain available for future use in both districts, ensuring sufficient supply to meet domestic and limited commercial demands over the coming decades.

Table 17 : Groundwater Extraction and Development Stage

Sl No.	Parameter	Jorhat District	Dibrugarh District
1	Total Annual Groundwater Extraction (ham)	5,887.85	7,786.09
	– Irrigation (ham)	4,215.12	4,890.48
	– Domestic Use (ham)	1,669.55	2,863.50
	– Industrial Use (ham)	3.18	32.08
2	Groundwater Allocation up to 2025 (ham)	1,756.71	3,088.53
3	Groundwater Available for Future Use (ham)	59,463.60	96,643.34
4	Stage of Groundwater Extraction (%)	8.99%	7.44%
5	CGWB Categorization	**Safe**	**Safe**

4.2.7 Ambient Air and Acoustic (Noise) Environnent

A. Ambient air quality

Ambient air quality monitoring was carried out at the proposed substation locations to assess baseline air quality conditions. The monitoring was conducted near the proposed substation boundaries which represents the core zone and the most likely area of impact during construction.

- For the 132/33 kV GIS substation at Titabor, the monitoring was conducted on 4th and 5th June 2025.
- For the 132/33 kV AIS substation at Chabua, the monitoring was conducted on 2nd and 3rd June 2025.

The results for air quality parameters are presented in the **Table 18** and the maps showing the sampling locations for the proposed Titabor and Chabua sites are provided in the **Figure 21** and **Figure 22** respectively. Air quality test reports for both sites are also provided in **Appendix-10**.

Table 18 : Air quality of the proposed subproject locations

Sl. No.	Parameters	Unit	Results at 132/33kV Titabor GIS	Results at 132/33kV Chabua AIS	Limits (NAAQS-24 hours)	Limits (WHO Global Air Quality Guidelines, 2021)	Test Method
1	Particulate Matter (PM_{10})	$\mu g/m^3$	42	46	100	45	IS 5182(23)
2	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	25	24	60	5	IS 5182(24)

Interpretation of Results

- The recorded PM_{10} concentrations at 132/33kV Titabor GIS was 42 $\mu g/m^3$ and 132/33kV Chabua AIS was 46 $\mu g/m^3$, significantly below the NAAQS 24-hour standard of 100 $\mu g/m^3$.
- The recorded $PM_{2.5}$ concentrations at 132/33kV Titabor GIS was 25 $\mu g/m^3$ and 132/33kV Chabua AIS was 24 $\mu g/m^3$, also well below the NAAQS threshold of 60 $\mu g/m^3$.

While the recorded concentrations of PM_{10} and $PM_{2.5}$ are within the permissible limits prescribed by National Ambient Air Quality Standards (NAAQS), they exceed the more stringent World Health Organization (WHO) guidelines. This reflects the difference in regulatory focus i.e. NAAQS consider the country's socio-economic conditions and existing pollution levels, while WHO sets ideal health-based targets. In urban and semi-urban areas of India, ambient air quality often exceeds WHO limits due to sources like road dust, vehicular emissions, biomass burning, and ongoing development activities. To address these exceedances, appropriate mitigation measures should be implemented during the construction of the proposed substations. These include regular water sprinkling, covering material stockpiles, scheduling dust-generating activities during low-wind periods, and providing adequate personal protective equipment (PPE) along with awareness programs for workers and nearby communities to reduce health risks.

B. Acoustic (Noise) Quality

Noise level monitoring was conducted at the habitation areas near the proposed substation premises to establish baseline ambient noise levels prior to construction. The locations represent typical existing sound conditions in areas surrounded by tea estates, with minimal commercial or industrial activity.

- Monitoring Date for 132/33 kV GIS Substation at Titabor: 3rd June 2025
- Monitoring Date for 132/33 kV AIS Substation at Chabua: 31st May 2025

The results for noise quality monitoring are presented in the **Table 19** and the maps showing the sampling locations for the proposed Titabor and Chabua sites are provided in the **Figure 21** and **Figure 22** respectively. Noise quality test reports for both sites are provided in **Appendix 11**.

Table 19 : Acoustic (Noise) quality of the proposed subproject locations

Sl. No.	Parameters	Unit	Results at 132/33kV Titabor GIS	Results at 132/33kV Chabua AIS	Method	WHO/CPCB Limit as per The Noise Pollution (Regulation and Control) Rules, 2000 Leq (dBA)
1	Leq	dB(A)	58.9	54.9	Ambient GEEC/SOP/AN /01 Issue Date 27/05/2017	CPCB Limit for Commercial Area: Day Time Leq<65 Night Time<55
2	Lmin	dB(A)	45.6	44.3		
3	Lmax	dB(A)	67.8	64.5		

Interpretation of Results

- The Leq (equivalent noise level) values at 132/33kV Titabor GIS was measured at 58.9 dB(A) and at 132/33kV Chabua AIS was measured at 54.9 dB(A) during the daytime, which are well **within the permissible limit of 65 dB(A)** for commercial areas as prescribed by the CPCB under The Noise Pollution (Regulation and Control) Rules, 2000 and WHO standards.
- The Lmin and Lmax values at both sites further indicate that the noise environment is stable and not subject to abrupt or excessive peaks.
- The monitored noise levels reflect a low ambient noise environment, consistent with the surrounding land use (tea garden areas), which is generally peaceful and sparsely developed in terms of commercial or traffic sources.

These results indicate **compliance with national noise standards**, suggesting no significant ambient noise pollution in the project influence areas. The baseline values provide a reference for monitoring potential noise increases during substation construction and operation phases.

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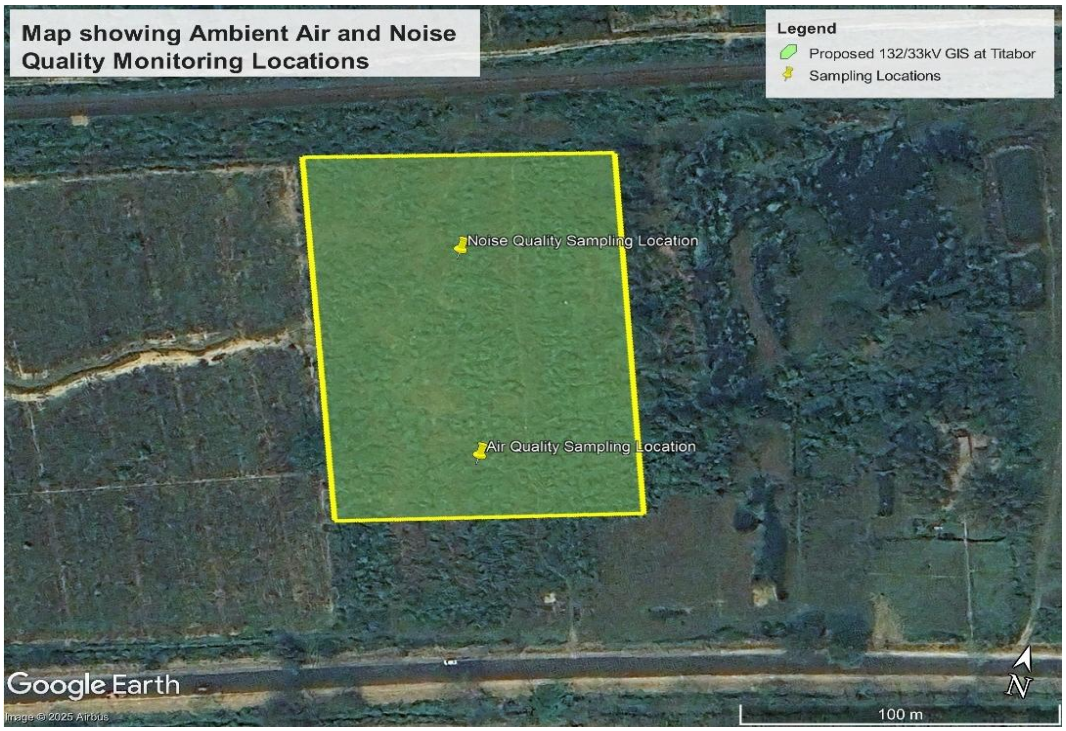

Figure 21: Baseline Air and Noise quality monitoring locations within Titabor site

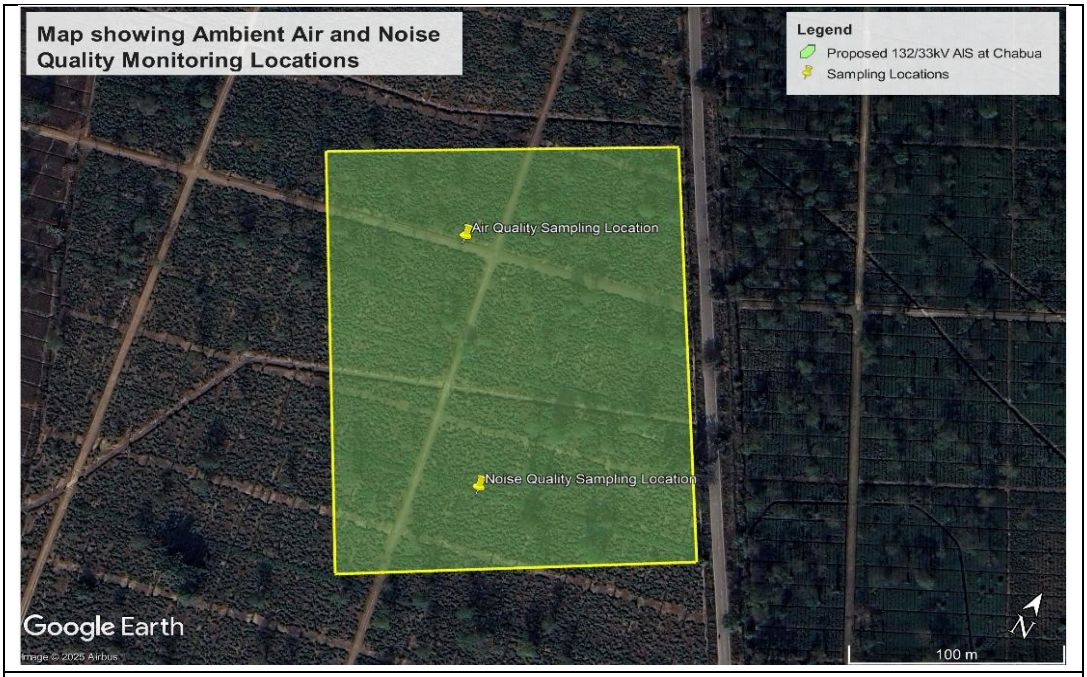

Figure 22: Baseline Air and Noise quality monitoring locations within Chabua site

4.3 Biological Environment Baseline of the Study Area

4.3.1 Forest Cover in Jorhat and Dibrugarh District

According to the Forest Survey of India (FSI) reports, the forest cover in Jorhat district is moderate when compared to districts in southern or hill-bound Assam. As per the 2023 forest assessment data, the total

geographical area of Jorhat district is 1,865 sq. km (as calculated by the Survey of India). The total forest cover is reported as 598.53 sq. km, which constitutes approximately 32.09 % of the district's area.

Similarly, Dibrugarh, located in the Upper Assam region, is one of the prominent districts of the state, known for its lush green tea gardens, rich biodiversity, and strategic location along the Brahmaputra River. According to the Forest Survey of India (FSI) reports, the forest cover in Dibrugarh district is also moderate when compared to some of the other districts in Assam. The total geographical area of Dibrugarh district is 3,397 sq. km (as calculated by the Survey of India). The total forest cover is reported as 766.59 sq. km, which constitutes approximately 22.57 % of the district's area.

Table 20: The breakdown of the forest cover in both subproject districts

District	Forest type and Area (in Sq. KM)			
	Very Dense Forest	Moderately Dense Forest	Open Forest	Scrub
Jorhat	13.36	110.27	474.90	11.75
Dibrugarh	106.03	68.70	591.86	11.30

While forest covers in Jorhat and Dibrugarh district are not extensive, its ecological significance is undeniable. While both the districts continue to develop industrially and agriculturally, it is imperative to strike a balance between development and conservation. Strengthening forest governance, enhancing community involvement, and promoting sustainable land-use practices are key to preserving the both district's remaining forests for future generations.

4.3.2 Tree Inventory and Vegetation Cover

As part of the baseline biodiversity assessment, preliminary site observations were carried out during the screening phase to understand the existing ecological baseline within the both proposed substations premises, which defines the study area for these subprojects. During this initial visit, a number of shade trees (Siris) and tea bushes are located within the project footprint were identified as likely to be impacted. The Titabor GIS site comprises approximately 6,521 tea bushes and 6 Siris trees (*Albizia lebbeck*), while the Chabua AIS site contains around 34,416 tea bushes and 92 Siris trees (*Albizia lebbeck*). These shade trees and tea bushes are proposed to be felled to allow for site clearance prior to the commencement of construction activities. These shade tree species (Schedule II) are exemted from prior permission for felling from Forest Department as per "*The Assam Trees Outside Forest (Sustainable Management Rules), 2022*". Avenue plantation measures will be undertaken to offset the ecological loss. Additionally, no fruit/timber species, no endemic, introduced, or endangered species of trees have been observed within the premises of the both sites indicating minimal impact on local biodiversity.

Figure 23: Trees to be felled within the Titabor GIS site

Figure 24: Trees to be felled within the Chabua AIS site

4.3.3 Faunal Observations and Community Inputs

To assess the presence of fauna in and around the project site, a community consultation was conducted with local residents, during the site visit. Based on the feedback gathered from the community and the observations made during the visit, it was confirmed that the subproject sites are neither located within nor adjacent to any designated Protected Areas (PAs), Eco-sensitive Zones (ESZs), or Critical Habitats.

Figure 25 shows the composite map of the proposed 132 kV Titabor GIS locations and its proximity to protected areas and eco-sensitive zone boundary within 10 KM radius. The nearest protected area Hollongapar Gibbon WLS is found at a distance of 8.43 km from proposed 132 kV Titabor GIS site. It may be noted that anticipated impact on the protected and its species will be negligible considering the distribution extent of the species of Hoolock Gibbon (*Hoolock hoolock*) and Stumptailed Macaque (*Macaca arctoides*) near the subproject site of 132 kV Titabor GIS. Hoolock Gibbon and Stumptailed Macaque are endangered primate as per IUCN and Schedule-I species as per Indian Wildlife Protection Act 1972. Consultation with the nearby community also do not reveals any sensitivity in terms of Hoolock Gibbon, Stumptailed Macaque or other wildlife movement in the subproject area and is thus less likely to have any adverse impact on the nearby protected areas.

Figure 26 shows the composite map of the proposed 132 kV Chabua GIS locations and its proximity to protected areas and eco-sensitive zone boundary within 10 KM radius and illustrates the absence of sensitive ecological zones in proximity to the proposed 132 kV Chabua AIS site.

The surrounding land use of both the study areas is predominantly composed of tea gardens or agricultural practices, which typically support low faunal diversity. No sightings of wildlife species were reported by the local community or observed during the field visit except some rodents, squirrels etc. Common domestic animals such as cattle, goats, dogs, and cats are frequently seen in and around the proposed sites. While occasional sightings of monkeys and snakes have been reported by residents, such occurrences are rare and transient. The avifauna observed in the area includes only common resident bird species such as mynas, bulbuls, pigeons, sparrows, crows etc. It may also be noted that no reporting of migratory birds in the near vicinity of the subproject sites.

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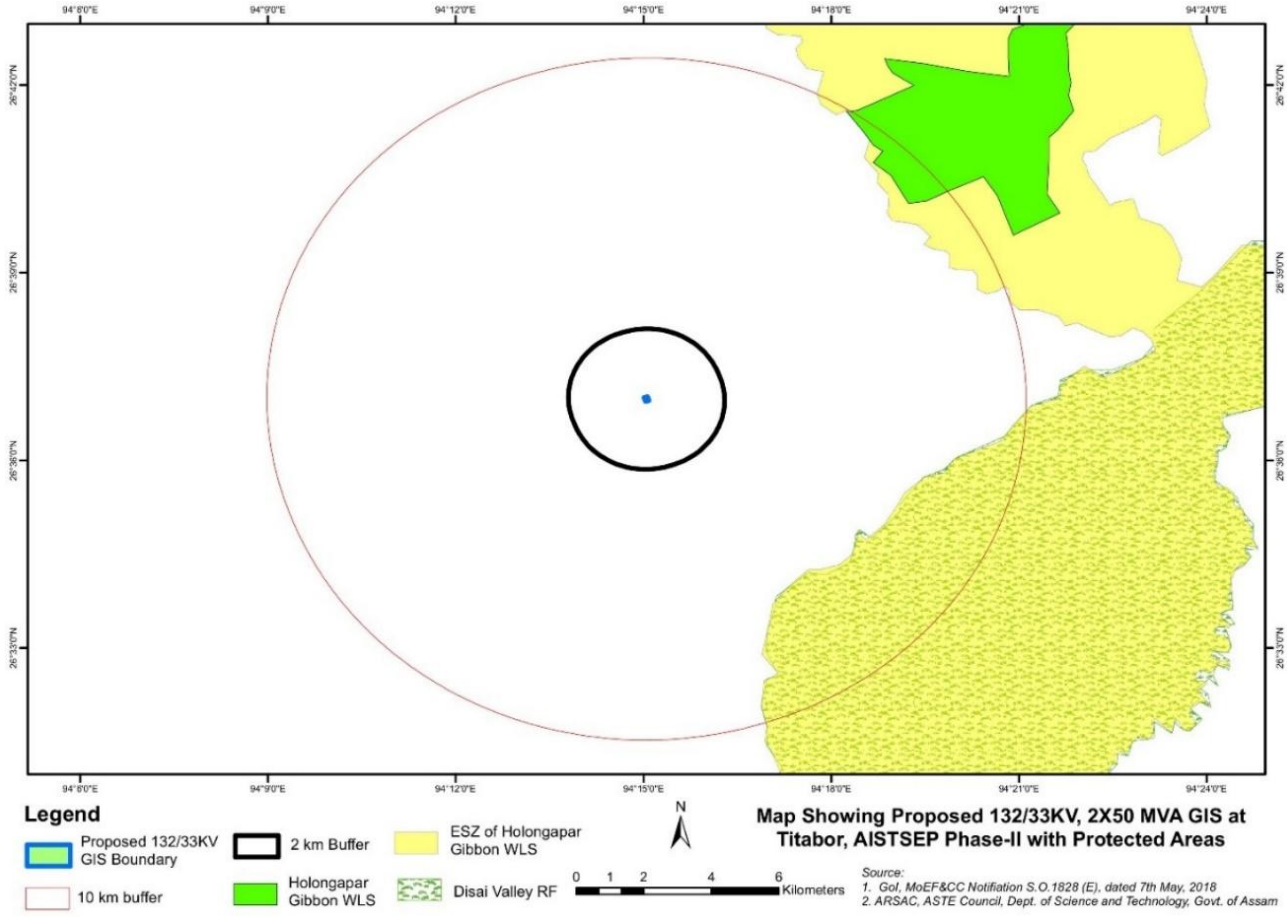

Figure 25: Map showing proposed 132/33 kV Titabor GIS site with protected areas

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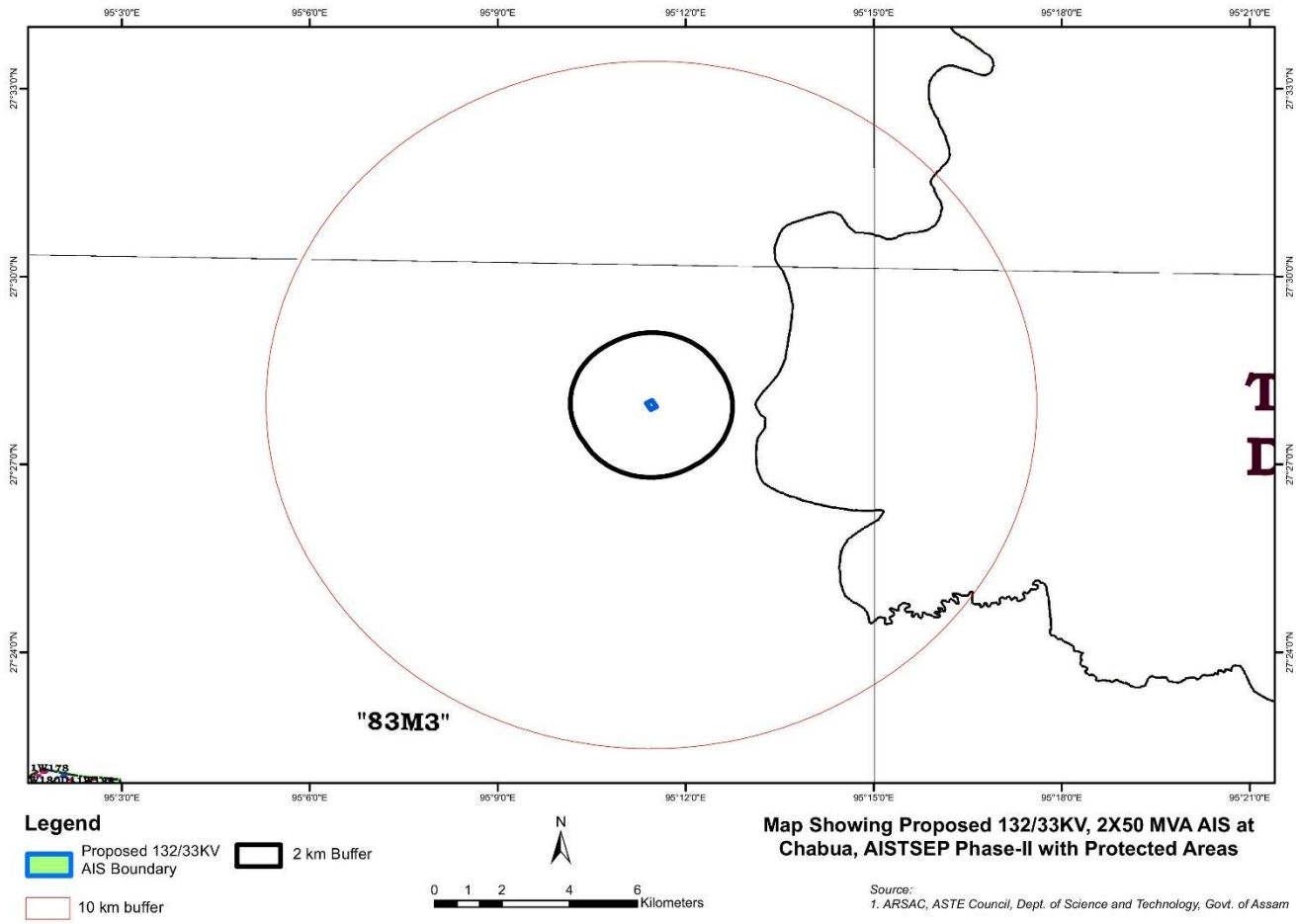

Figure 26: Map showing proposed 132/33 kV Titabor GIS site with protected areas

4.4 Socio-economic Environment

4.4.1 Demographic Profile

i) 132/33KV, 2X50 MVA GIS at Titabor

The proposed 132/33KV (2X50) MVA GIS at Titabor will be constructed in the revenue village of Karikatia Grant under Titabor Block of Jorhat District. As per the Census of India 2011, Jorhat district of Assam had a total population of 1,092,256, comprising 556,805 males and 535,451 females, resulting in a sex ratio of 961 females per 1000 males. The district had a population density of 364 persons per square kilometer. The literacy rate in Jorhat was relatively high at 83.42%, with male literacy at 88.84% and female literacy at 77.82%. Children in the age group of 0–6 years numbered 118,988, and the child sex ratio stood at 954 girls per 1000 boys. The urban population constituted about 17.21% of the total population. In terms of social composition, Scheduled Castes (SC) made up 7.32%, while Scheduled Tribes (ST) accounted for 12.09% of the district's population.

As per the Census 2011, the Titabor Development Block in Jorhat district, Assam, had a total population of 201,791, comprising 102,720 males and 99,071 females, resulting in a sex ratio of 964 females per 1000 males. Children aged 0–6 years numbered 22,957, accounting for approximately 11.38% of the total population. The literacy rate in the block stood at 80.48%, with male literacy at 86.16% and female literacy at 74.58%. The Scheduled Castes (SC) constituted 6.09% of the population, while the Scheduled Tribes (ST) made up 13.18%. The block had a population density of 517 persons per square kilometer, spread over an area of 390.29 square kilometers. In terms of religious composition, Hindus comprised 88.13% of the population, Muslims 6.36%, and

Christians 4.48%. The remaining population included Sikhs, Buddhists, Jains, and others. The working population totaled 98,749, with 61,621 engaged in main work and 37,128 in marginal activities. Among the main workers, 18,302 were cultivators, 7,152 agricultural laborers, 2,834 in household industries, and 33,333 in other occupations. Administratively, the Titabor Development Block comprised 164 villages and 1 town (Titabor Town).

As per the Census 2011, Karikatia Grant (also known as Kharikatia TE) village in Titabor Development Block, Jorhat district, where the proposed substation will be constructed had a population of 1,974, comprising 1,017 males and 957 females, with a sex ratio of 942 females per 1000 males. The child population (0–6 years) was 250, and the child sex ratio was 1,067. The literacy rate stood at 74.19%, with male literacy at 83.82% and female literacy at 63.77%. The village had 424 households, and 882 people were engaged in work, including 548 males and 334 females. Scheduled Castes constituted 0.15% of the population, and there was no Scheduled Tribe population recorded.

ii) 132/33KV, 2x50MVA AIS at Chabua

The proposed 132/33KV (2X50 MVA) AIS at Chabua will be constructed in the revenue village of **Chabua T.E**. under Panitola Block of Dibrugarh District. The district is located in Upper Assam, had a total population of 1,326,335 as per the 2011 Census, comprising 676,434 males and 649,901 females, resulting in a sex ratio of 961 females per 1,000 males, slightly above the state average of 958. Children aged 0–6 years numbered 163,210, accounting for approximately 12.3% of the total population, with a child sex ratio of 962 girls per 1,000 boys. The district spans an area of 3,381 square kilometers, leading to a population density of 392 persons per square kilometer. The literacy rate stood at 76.05%, with male literacy at 82.82% and female literacy at 68.99%. In terms of religious composition, Hinduism was the predominant faith, followed by 90.35% of the population. Other religions included Islam (4.86%), Christianity (3.99%), Buddhism (0.35%), Sikhism (0.17%), and Jainism (0.08%). Linguistically, the majority of the population spoke Assamese (76.01%), followed by Bengali (5.93%), Hindi (5.80%), Sadri (4.83%), Nepali (1.72%), Bhojpuri (1.13%), and Odia (1.00%). The district's economy is significantly influenced by tea cultivation, with many residents engaged in tea plantations and related industries. The tea-garden community, primarily descendants of migrants from states like Madhya Pradesh, Bihar, Odisha, and Jharkhand, contributes to the district's cultural diversity.

Panitola Community Development Block of Dibrugarh district, covers a total geographical area of 205.51 square kilometers. As per the Census of India 2011, it had a total population of 124,723 individuals, comprising 64,461 males and 60,262 females, resulting in a sex ratio of approximately 935 females per 1,000 males, which is slightly lower than the district average. The block had 25,470 households, indicating an average household size of about 4.9 persons. The child population (0–6 years) was recorded at 16,648, with 8,481 males and 8,167 females, giving a child sex ratio of 963, which is relatively balanced compared to the adult sex ratio. The block's Scheduled Caste (SC) population stood at 6,944, while the Scheduled Tribe (ST) population was 5,505, accounting for 5.6% and 4.4% of the total population respectively. Regarding employment, Panitola had 50,634 total workers, with 34,814 main workers (those employed for more than 6 months) and 15,820 marginal workers (employed for less than 6 months). Among the main workers, a significant number were engaged in cultivation and agricultural labor, indicating a predominantly agrarian economy.

Chabua T.E. is a village covering an area of 844.76 hectares. As per the Census, 2011, it comprises 1,101 households, with a total population of 5,576 individuals. Of this population, 2,835 are males and 2,741 are females, resulting in a sex ratio of approximately 967 females per 1,000 males. The population density is around

6.6 persons per hectare, indicating a moderately populated rural area. A significant segment of the population consists of children in the 0–6 years age group, totaling 903 individuals. Among them, 478 are male and 425 are female, giving a child sex ratio of about 889 females per 1,000 males. Children in this age group make up roughly 16.2% of the total population

4.4.2 Economic Profile

i) 132/33KV, 2X50 MVA GIS at Titabor

In Jorhat District, agriculture and tea cultivation form the economic backbone. According to the Statistical Handbook Assam, the district has approximately 27,675 hectares under tea cultivation, making it one of Assam's key tea-producing regions. In addition to tea, rice is the principal crop, supported by the cultivation of wheat, maize, jute, pulses, oilseeds, vegetables, rubber, and coffee. Livestock rearing—including cattle and poultry—along with inland fisheries, supplement rural household incomes. The district also has a modest industrial presence, including small-scale units engaged in cane and bamboo crafts, furniture making, and food processing. Institutions such as Assam Agricultural University in Jorhat contribute significantly to agricultural research, education, and extension services, further strengthening the region's agri-based economy.

In Titabor Block, the rural economy is dominated by tea and crop cultivation. The surrounding area includes several well-known tea gardens such as Narayanpur Panbari, Saraipani, Bukaholla, and Letekujan, which provide direct employment to a large number of local residents. Farming systems in this block are often diversified—many smallholders practice mixed farming that includes tea, paddy cultivation, horticulture, fishery, and livestock-based enterprises. The block also sees active engagement in dairy, poultry, and piggery activities, particularly among households looking to augment their seasonal agricultural income. These integrated livelihood strategies are common across the block and support food security and resilience.

In Karikatia Grant village, part of Titabor Block, the economy reflects the broader block-level trends. Many residents are employed in nearby tea estates, while others engage in subsistence agriculture. Paddy, pulses, and vegetables are grown on small plots, and animal husbandry—especially cattle, goats, and poultry—forms a critical part of the livelihood strategy. While the village does not host a major market or industrial base, its proximity to larger estates and towns allows residents to access employment and sell surplus produce locally. Though no dedicated economic data is available at the village level, the occupational pattern aligns closely with Titabor's overall agro-plantation economy.

ii) 132/33KV, 2x50MVA AIS at Chabua

Dibrugarh district's economy is primarily agrarian, with over 70% of the population engaged in agriculture and allied activities. The region is famously known as the "Tea City of India," with around 144 large tea estates contributing significantly to Assam's tea production and employment. Key crops include rice, pulses, oilseeds, and vegetables, while livestock rearing, dairy, poultry, and fisheries support rural livelihoods. The district also hosts industrial enterprises like Oil India Ltd., Assam Petrochemicals Ltd., and Brahmaputra Cracker & Polymer Limited, adding to its economic diversity.

In Panitola Block, the rural economy is driven by small-scale farming, livestock, and employment in tea gardens. Hybrid rice cultivation, vegetable farming, pig and poultry rearing, and fisheries are common livelihood sources. Youth participation in small tea cultivation has increased over the years. While the block has fewer large tea estates compared to central Dibrugarh, the tea sector still provides substantial employment.

Chabua Tea Estate village is economically centered around tea cultivation. It forms part of one of Assam's oldest tea estates, employing a large labor force. Residents also engage in livestock rearing, kitchen gardening, and occasional fishing.

4.4.3 Road Network

i) 132/33KV, 2X50 MVA GIS at Titabor

The proposed substation site for the 132/33 kV (2x50 MVA) GIS subproject is located at Kharikatia Grant village, in Titabor Block, under Jorhat district, Assam. The site is geographically positioned at latitude 26°36'58.79"N and longitude 94°15'02.20"E. It lies approximately 22 kilometers from Jorhat town, the district headquarters, and is well-connected by a reliable road network. Two major arterial roads, Gar-ali and Na-ali, provide direct connectivity between Titabor town and Jorhat, ensuring smooth vehicular movement throughout the year.

The substation site benefits from strategic positioning within a natural boundary defined by the Naga Hills to the south, Kakodonga River to the west, Kachajan River to the east, and Choikota River to the north. Despite this enclosed geography, road access remains unhindered due to well-maintained regional roads and bridges. Local and rural roads further connect Kharikatia Grant to neighboring villages and internal areas of Titabor, making the substation location highly accessible.

Transportation infrastructure in the area is further supported by the presence of Titabor Railway Station, located centrally within Titabor town, which facilitates logistical movement of equipment and personnel. The nearest airport, Rowriah (Jorhat Airport), is situated just 25 kilometers away, enhancing regional and inter-state connectivity. With a dependable combination of national, regional, and local roads along with rail and air transport options, the proposed substation site at Kharikatia Grant offers excellent connectivity for both construction and long-term operational needs.

ii) 132/33KV, 2x50MVA AIS at Chabua

The proposed substation site at Chabua Tea Estate village is located approximately 3 kilometers from Chabua town, making it easily accessible by road. Chabua, a key town in Assam's Dibrugarh district, boasts an excellent road network, strategically positioned along National Highway 37 (NH-37). This national highway forms the backbone of regional connectivity, linking Chabua directly to Dibrugarh town (about 30 km away) and Tinsukia town (approximately 20 km to the west). For travelers coming from Guwahati, the state capital, Chabua is accessible via a 466-kilometer route, typically requiring around 10 hours and 6 minutes of travel via National Highway 27 (NH-27) and National Highway 715 (NH-715).

The substation site is well-integrated into this network, benefiting from local roads and state highways that extend connectivity to nearby tea estates, rural settlements, and smaller towns within Dibrugarh district. Notably, infrastructure upgrades completed in October 2020 have significantly enhanced regional mobility, including the construction of a 2-lane NH-37 highway with paved shoulders and bypasses through Mohanbari and Chabua. These improvements have optimized traffic flow and improved access to key locations such as the Chabua substation site.

Public and private transportation services further support connectivity, with regular bus services linking Chabua to major towns like Dibrugarh, Tinsukia, and Guwahati. Additionally, taxis and shared transport services are readily available for local and last-mile travel. Overall, the substation site at Chabua Tea Estate enjoys robust

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and multi-tiered road connectivity, ensuring reliable access for both construction logistics and future operational maintenance.

4.4.4 Literacy Rate and Education

i) 132/33KV, 2X50 MVA GIS at Titabor

According to the 2011 Census of India, Jorhat District recorded an overall literacy rate of 82.15%, with male literacy at 87.63% and female literacy at 76.45%. This places the district among the more literate regions of Assam. In urban areas, the literacy rate is significantly higher at 90.39%, compared to 80.01% in rural areas. The gender disparity is evident, particularly in rural regions, where male literacy reaches 86.24%, while female literacy lags at 73.58%.

In terms of educational infrastructure, Jorhat district has a well-developed system, including several institutions of higher education. These include Assam Agricultural University, the North East Institute of Science and Technology (NEIST), J.B. College (one of Assam's oldest degree colleges), and Kaziranga University, a private multidisciplinary university. Additionally, the district also hosts Titabar College, Jagannath Barooah College, and D.R. College, among others, which cater to undergraduate education across various disciplines. Despite the presence of these institutions in urban areas, access to higher education in remote or rural areas still remains limited.

In Titabor Block, the overall rural literacy rate is 79.31%, with male literacy at 85.33% and female literacy at 73.09%, reflecting a gender gap of approximately 12.24 percentage points. In contrast, Titabor town shows a much stronger performance with a literacy rate of 92.26% (male: 94.43%, female: 89.92%), and a reduced gender gap of only 4.51%. The town is served by 25 primary schools, 13 middle schools, 10 secondary schools, 2 senior secondary schools, and 3-degree colleges (Source: Census of India 2011). Although it lacks medical colleges and polytechnics directly within the block, such facilities are available in nearby Jorhat town, offering access to higher technical and health education.

Karikatia Grant Village (also referred to as Khariakatia Gaon) does not have separate literacy data listed, but as part of the Titabor rural block, it likely mirrors the block's overall rural literacy rate. While there are no higher education institutions or heritage academic structures in the village, basic education facilities such as primary schools are available. As part of a tea garden region, the village also benefits from regional literacy initiatives and government programs such as the Sarva Shiksha Abhiyan, which support educational access for tea tribe and marginalized communities.

ii) 132/33KV, 2x50MVA AIS at Chabua

Based on the 2011 Census data Dibrugarh district had a total of 560,557 literate persons, with 368,013 males and 192,544 females, resulting in an overall effective literacy rate of 76.05%. Male literacy was significantly higher at 82.82%, compared to female literacy at 68.99%. The district had a well-developed educational infrastructure with multiple levels of institutions, including government and private primary, middle, secondary, and senior secondary schools, as well as higher educational institutions such as Dibrugarh University, engineering colleges, and medical colleges, contributing to its reputation as an educational center in Upper Assam.

Within Panitola Community Development Block, there were 72,642 literate individuals—42,657 males and 29,985 females—yielding a literacy rate of approximately 67%. Panitola Block included 89 inhabited villages and

had a network of educational institutions, including 97 primary schools and 52 middle schools across its territory. Despite decent school availability, the block still showed a marked gender disparity in literacy, reflecting the need for improved female educational access, possibly due to distance, socioeconomic factors, and cultural norms influencing girls' attendance at higher levels.

Chabua T.E. (Tea Estate) village, part of Panitola Block, had a population of 5,576 with 2,344 literates—1,501 males and 843 females—giving it a relatively low literacy rate of 42%. The village was served by 2 primary schools and 1 middle school, indicating limited local access to education. As a plantation settlement, Chabua T.E. faces socio-economic challenges common among tea garden communities, such as low income, limited parental education, and poor school attendance, especially among girls, which contributes to its low literacy figures and limited educational advancement opportunities.

4.4.5 Health Infrastructure

i) 132/33KV, 2X50 MVA GIS at Titabor

In Jorhat district, healthcare infrastructure is anchored by a structured network of 110 Primary Health Sub-Centres, 35 Rural Primary Health Centres (PHCs), and 6 Community Health Centres (CHCs), ensuring wide coverage across both rural and semi-urban areas. This network provides essential services such as maternal and child healthcare, immunization, disease surveillance, and outpatient care. The district is home to Jorhat Medical College & Hospital, a major tertiary care facility that supports referrals from across Upper Assam. Additional services are offered through 2 Sub-Divisional Civil Hospitals, 22 private nursing homes or polyclinics, and 24 diagnostic centers, further strengthening curative and emergency care accessibility. (Source: Statistical Handbook Assam 2023–24; NER Databank (NEDFi) North Eastern Development Finance Corporation Ltd.)

With a population of approximately 1,092,256 (as per Census 2011), Jorhat's health facility-to-population ratios are as follows: around 10 Primary Health Sub-Centres, 3.2 PHCs, and 0.55 CHCs per one lakh population. These figures suggest a moderately strong health infrastructure in comparison to national rural health norms. The presence of both public and private health providers, combined with functional referral mechanisms, contributes to a reasonably well-distributed healthcare system across the district. Assam Economic Survey 2022–23 reports that the average life expectancy at birth for the state stood at 66.9 years, which is the lowest among states in the northeastern region . While district-level figures for Jorhat are not published separately by the government, demographic modeling and Sample Registration System (SRS) data suggest that actual district-level life expectancy likely aligns closely with or slightly exceeds the state average, particularly within rural and urban contexts where healthcare infrastructure is relatively developed.

Moving to Titabor Block, the area is serviced by several PHCs and sub-centres, with around ten PHCs referenced in health surveys such as the Reproductive and Child Health Survey (RHS) 2011. These centres cater to maternal and child health, immunization, family planning, and general outpatient services. A study on rural health-seeking behavior emphasised that many residents rely on these government facilities, alongside local private practitioners, for common illnesses. Accessibility is generally good, although travel time can increase for more distant villages.

In Karikatia Grant village (Khariakatia Gaon), no separate health facility is documented in the 2011 census; residents typically access the nearest sub-centre or PHC in Titabor Block, which are located within approximately 2.8 and 4 kilometers respectively. This setup provides basic care and referral services, though patients must travel to Jorhat or Titabor for advanced treatment or specialized care.

ii) 132/33KV, 2x50MVA AIS at Chabua

Based on the data from the District Census Handbook of Dibrugarh, the district comprises 1,348 villages, of which 1,318 are inhabited. Out of these, 116 villages have Primary Health Sub-Centres, 63 have Primary Health Centres (PHCs), and 10 villages have Community Health Centres (CHCs). This distribution of healthcare facilities corresponds to an estimated ratio of approximately 8.7 Primary Health Sub-Centres, 4.7 Primary Health Centres (PHCs), and 0.75 Community Health Centres (CHCs) per one lakh population in Dibrugarh district, based on the total population of 1,326,335 (Census 2011). Additionally, 102 villages have medicine shops, and 106 have access to services of an MBBS doctor. Mobile health clinics and traditional health practitioners are also noted in several areas. Urban centers in the district, particularly Dibrugarh town, continue to provide access to more advanced medical facilities, including hospitals and specialty care, which significantly support health service accessibility throughout the district. Assam Economic Survey 2022–23 reports that the average life expectancy at birth for the state stood at 66.9 years, which is the lowest among states in the northeastern region . While district-level figures for Dibrugarh are not published separately by the government, demographic modeling and Sample Registration System (SRS) data suggest that actual district-level life expectancy likely aligns closely with or slightly exceeds the state average, particularly within rural and urban contexts where healthcare infrastructure is relatively developed.

In Panitola Community Development Block, which includes 89 inhabited villages, the health infrastructure remains more limited compared to urban parts of the district. The block has 8 villages with Primary Health Sub-Centres and 3 villages with Primary Health Centres. Seven villages have allopathic hospitals, three have maternity and child welfare centers, and two villages offer services of traditional medical practitioners or healers. Moreover, only four villages have medicine shops, and only a few receive regular visits from qualified doctors. The presence of Accredited Social Health Activists (ASHAs) and Anganwadi centers continues to support basic maternal and child healthcare, though there remains a clear need for more permanent and better-equipped health institutions.

Chabua T.E. (Tea Estate) village, with a population of 5,576, continues to have limited health infrastructure. It has one Primary Health Sub-Centre but lacks a Primary Health Centre or hospital within the village. The estate relies on nearby urban centers such as Chabua town or Dibrugarh for higher medical needs. However, the presence of the Tata Referral Hospital, located within Chabua Tea Estate and approximately 2 kilometers from the proposed substation site, offers some access to secondary care services for estate workers and nearby residents, serving as an important referral point in the area.

4.4.6 Electricity, Water and Sanitation Facilities

i) 132/33KV, 2X50 MVA GIS at Titabor

In Jorhat District, nearly all inhabited villages had electricity access according to the 2011 Census Village Directory, reflecting village-level saturation across both rural and urban areas. Official updates from APDCL, as featured in Assam's Statistical Handbook (via NER Databank), report that by 2018 rural household electrification had reached approximately 90%, with the district achieving near-universal village-level grid coverage. This indicates that nearly all villages in Jorhat district were connected to the electricity grid, with an estimated 90% of rural households having individual electricity connections by 2018–19. In urban centers like Jorhat town, the electrification rate is even higher, effectively reaching full household coverage. These figures illustrate a strong and rapidly expanding power infrastructure supported by APDCL's distribution network in the district. Regarding

drinking water, village infrastructure includes a mix of sources: handpumps, tube wells, covered wells, and tap water in certain areas. Handpumps are the primary source in rural regions, ensuring universal access to safe drinking water in the district. Some urban localities are equipped with treated tap connections, although coverage varies. In terms of sanitation, many villages report having functional community toilets, public latrines, or individual household facilities. However, open defecation remains prevalent in a smaller proportion of rural villages. Towns and semi-urban areas tend to have better access to latrine infrastructure, often supported by municipal systems or public-private partnerships.

Moving to Titabor Block, the same infrastructure pattern broadly applies: near-universal village electrification, reliance on handpumps for drinking water, supplemented by a limited number of tap water connections in more centralized settlements. Sanitation facilities—comprising mostly latrines and public/community toilets—are accessible in most villages, but coverage gaps persist in remote or less populated hamlets.

In Karikatia Grant Village (Khariakatia Gaon), while no dedicated village-level infrastructure details are separately listed in the census, its inclusion within Titabor Block suggests similar conditions: electricity supply is available, handpumps serve as the primary drinking water source, and sanitation is provided via individual or shared latrines, with some households potentially relying on open defecation due to lack of access.

ii) 132/33KV, 2x50MVA AIS at Chabua

Dibrugarh district in Assam has witnessed significant improvements in basic infrastructure over recent years, especially in electricity, water supply, and sanitation. Most households in the urban areas of the district now enjoy uninterrupted electricity supply, while rural areas have also seen a substantial increase in electrification rates due to state-led rural electrification programs. Solar-powered Street lighting and grid-based domestic connections are increasingly common in semi-urban and tea garden regions. The reliability of power in critical institutions such as hospitals, schools, and government offices has also improved, enhancing service delivery across sectors.

In Panitola Block, part of Dibrugarh district, the availability of basic utilities has expanded gradually. Electricity connections have reached the majority of households, including those in more remote tea estate villages. Drinking water is primarily supplied through handpumps and piped water schemes managed under government initiatives such as Jal Jeevan Mission. While these have ensured coverage in most revenue villages, challenges remain in maintaining continuous and safe water supply, particularly during dry seasons. Sanitation infrastructure in Panitola has also seen notable development, with the construction of household toilets under the Swachh Bharat Mission and the spread of soak pits and septic systems. However, the absence of underground sewerage systems means that open drainage is still prevalent in several villages, especially in low-lying areas prone to flooding.

Chabua Tea Estate village, located within Panitola Block, has benefited moderately from district-level development programs. Electrification has reached the village, covering workers' quarters and operational buildings, with additional support from estate-managed infrastructure. Drinking water is largely sourced from estate-maintained tube wells and government-installed handpumps, though the availability of piped water is limited. Sanitation facilities have been gradually introduced, but gaps remain in waste management and drainage, particularly in densely inhabited workers' colonies. While the village now has basic amenities in place, periodic support from both public and private entities remains essential to achieving universal access to clean water and improved sanitation.

4.4.7 Cultural Resources

i) 132/33KV, 2X50 MVA GIS at Titabor

Jorhat is widely regarded as the “Cultural Capital of Assam”, with deep roots in Assamese traditions and contributions to literature, performing arts, and spiritual practices. Historically, it was the last capital of the Ahom kingdom, which significantly influenced the cultural landscape by introducing grand public celebrations of festivals like Bihu. The three types of Bihu—Magh (Bhogali), Bohag (Rongali), and Kati (Kangali)—are celebrated with great enthusiasm. These festivals, especially Rongali Bihu, feature traditional dance and music that reflect rural fertility rites and the emotions of youth. Apart from Bihu, Bhaona, a traditional form of religious theatre introduced by Srimanta Sankardeva, continues to thrive in village Namghars across the district. Major Vaishnavite celebrations, such as Rash Utsav, Janmastami, Dol Jatra, and Durga Puja, also form part of the district’s vibrant cultural calendar. Institutions like the Assam Agricultural University, NEIST, and the Asom Sahitya Sabha further contribute to Jorhat’s intellectual and cultural prominence. Jorhat is also known for being the birthplace of several renowned writers, musicians, actors, and historians.

Titabor Block reflects the broader cultural richness of the district. It serves as a center for tea garden culture, with vibrant traditions rooted in the lives of the tea tribes, who maintain unique cultural practices, folk music, and community festivals. The town of Titabor is also listed among the manufacturing hubs for local products such as tea, atta, and cable wires, indicating the blend of cultural economy and industrial activity. Public cultural infrastructure such as auditoriums, community halls, libraries, and reading rooms is available in Titabor town, facilitating cultural programs and social gatherings. The presence of educational and cultural facilities makes Titabor an active node in promoting local heritage and communal identity. Additionally, the Kamalabari Satra, although originally from Majuli, was relocated to Mahimabari near Titabor due to river erosion. This satra is a center for Sankari culture, especially Satriya dance and music, and hosts festivals like Rash Utsav and the anniversaries of saints like Sankardeva and Madhabdeva.

Karikatia Grant Village, also listed as Khariakatia Gaon, does not have any specifically documented cultural monuments or formal institutions of heritage. However, it lies within the cultural influence zone of the tea estates and the broader Titabor region. The tea tribe communities residing in and around the village are the custodians of a rich oral and performative cultural tradition, including folk dances, songs, and community rituals. These traditions are closely tied to the tea garden way of life and represent a living form of intangible cultural heritage.

ii) 132/33KV, 2x50MVA AIS at Chabua

Dibrugarh district, often called the "Tea City of India," has a rich cultural heritage deeply rooted in both Ahom history and British colonial influence. Historically, it derives its name from “Dibrumukhar Garh,” referring to the strategic fort constructed by the Ahoms and later the British. Dibrugarh's cultural resources include public libraries, reading rooms, sports fields, and community halls that are found in many of its towns and larger villages. In urban areas, there is regular access to cinemas, cultural clubs, and venues for performing arts. The district has a tradition of hosting Bihu festivals, Namghars (prayer halls), satras, and local fairs, which contribute to maintaining a strong sense of community and Assamese identity. Recreational facilities such as playgrounds and sports grounds are available in most urban centers and select rural locations.

In Panitola Block, cultural resources are more modest but reflect the rural vibrancy of Assam. While most villages do not have formal cultural centers, a few villages host public libraries and community halls that double as

venues for religious and cultural events. Namghars and temple grounds serve as key spaces for gathering during Bihu and other regional festivals. Local youth engage in traditional games and sports, often utilizing school fields or open village spaces for football and athletics. The block supports informal cultural activities, especially in tea garden areas where community cultural practices remain strong, though under-documented. These resources help preserve the folk traditions, dialects, and music of diverse ethnic groups living in the block.

Chabua T.E. Village, being a tea estate settlement, exhibits a unique blend of tribal and plantation culture. While formal cultural institutions are absent, the community actively engages in traditional festivals and informal gatherings. Cultural life in the village revolves around seasonal dances, music, and festivals, often held in open areas within the es tate. Due to the socio-economic limitations, there is no public library, reading room, or designated sports field in the village, although informal play and cultural expression persist, especially among the youth. The estate setting nurtures a multi-ethnic atmosphere where Adivasi customs from central India mingle with local Assamese influences, creating a distinct cultural identity.

4.4.8 Archaeological and Historical Monuments

i) 132/33KV, 2X50 MVA GIS at Titabor

Jorhat District holds significant archaeological and historical importance as the last capital of the Ahom Kingdom. Key monuments include Bongalpukhuri and Borpukhuri, tanks linked to 18th-century political events; Burhi Gosani Devalaya, a temple commemorating Ahom victories; and Garh Ali, a defensive embankment from the Pratap Singha era. Lachit Borphukan's Maidam honors the Ahom general who defeated the Mughals, while Raja Maidam is the burial site of King Purandar Singha. Thengal Bhawan, built in 1880, marks the beginning of Assamese journalism.

In Titabor Block, though specific monuments are not mentioned, the area is historically significant for its agricultural richness and its connection to Maniram Dewan, a pioneer of the tea industry and freedom fighter. His Cinamara Tea Estate represents Assam's colonial resistance and economic history.

Karikatia Grant village (also known as Khariakatia Gaon) under Titabor Block does not have any specific archaeological or historical monument, as confirmed both by official records and through public consultations with the local community. However, the village is culturally influenced by the surrounding tea garden heritage, with a strong presence of tea tribe communities. Their traditions, festivals, and way of life contribute significantly to the local cultural landscape, even though no formal or recognized heritage structures exist in the area.

ii) 132/33KV, 2x50MVA AIS at Chabua

Dibrugarh district possesses a rich historical background influenced by the Ahom kingdom and the British colonial period. The name "Dibrugarh" is believed to have originated from Dibrumukhar Garh, a fort constructed by the Ahoms at the mouth of the Dibaru River. This site later gained prominence during British rule, as the British also built a strategic fortification in the same region, although both structures have since eroded due to the action of the Brahmaputra River. The town of Dibrugarh served as the district headquarters for Lakhimpur before becoming a district of its own in 1976. During World War II, Dibrugarh was also a significant British military base and transit camp for evacuees from Burma. While no major preserved monuments remain, historical sites and relics related to these periods continue to hold cultural value and inform the district's identity.

Within Panitola Block, there are no officially documented archaeological or historical monuments listed in the 2011 Census handbook. However, oral histories and local landmarks—particularly those related to tea estate development, colonial-era bungalows, and religious structures like Namghars—contribute to the cultural landscape of the region. The block is part of Assam's broader tea-producing region and carries historical significance tied to British-era plantation practices, which are embedded in the architecture and layout of several villages and estates.

Chabua T.E. Village, being part of one of the oldest tea-growing areas in Assam, also reflects cultural and historical continuity through its estate environment. While no formal archaeological or protected historical monuments are noted in the village, the tea estate itself forms part of Assam's living heritage, having been shaped during the British colonial period. Structures such as old tea factory buildings, workers' lines, and administrative bungalows often date back to the 19th and early 20th centuries and serve as tangible links to the village's historical evolution under colonial economic systems. However, public consultation has confirmed that no such historical or heritage structures exist within a 1 km radius of the proposed substation site at Chabua T.E. Village.

Chapter 5: Analysis of Alternatives

5.1 Introduction

This chapter presents the analysis of alternatives for the proposed construction of two substations: the 132/33 kV GIS at Titabor (Jorhat district) and the 132/33 kV AIS at Chabua (Dibrugarh district). In accordance with the AIIB's Environmental and Social Framework (ESF, 2024), the assessment considers environmentally and socially viable options evaluated during project planning.

The AIIB ESF mandates that alternative scenarios be compared based on factors such as investment, location, design, technology, and the "no project" scenario. This analysis aims to confirm that the selected project alternatives minimize environmental and social risks, ensure cost-effectiveness, and are operationally feasible under local conditions.

5.2 Without Project Scenario

In the absence of the proposed substations, the regional transmission infrastructure would continue to face the following issues:

- Overloading of existing substations and transmission lines,
- Inability to meet the rising demand for electricity in the region,
- Reduced reliability and stability of power supply,
- Constraints in integrating renewable energy sources,
- Slowed regional development due to inadequate power infrastructure.

The "without project" scenario is not considered viable as it would hinder Assam's long-term energy reliability, grid resilience, and socio-economic development.

5.3 Site Selection Process

The site selection process prioritized the use of government land or privately-owned parcels with minimal social and environmental impacts. The following key criteria were considered in evaluating and finalizing suitable substation sites:

- Preference for government land or private land where no involuntary acquisition is required,
- Proximity to public roads to ensure easy transportation of construction materials and equipment,
- Avoidance of forested areas, archaeological sites, burial grounds, and flood-prone zones,
- Strategic location near load centers or urban areas to support efficient power distribution,
- Availability of sufficient space to accommodate the termination of 132 kV and 33 kV transmission lines.

132/33kV GIS at Titabor

AEGCL acquired 1.21 hectares of land situated within Letekujan Tea Estate, operated by M/s Kasojan Tea Company Pvt. Ltd., in Karikatia Grant Village under the Titabor Revenue Circle. Due to the unavailability of suitable government land, a private tea estate parcel was selected for minimal disruption and faster implementation.

The selected site:

- Was acquired through mutual negotiation with the tea estate authority to facilitate timely execution of the project,
- Involved no adverse impacts on tea garden workers, local communities, or tea cultivation,
- Lies adjacent to a public road, ensuring ease of logistics and site accessibility,
- Is free from forest land, protected areas, encroachments, or ecologically sensitive zones,
- Is technically suitable for substation layout and integration with the grid**.**

The land was formally transferred to AEGCL **on 07.10.2021.** Letekujan Tea Estate has a total grant area of **303.61 hectares**, of which **229.80 hectares** are currently planted. The affected **1.21-hectare** parcel was adjusted using available unplanted areas within the estate, ensuring no disruption to estate operations or tea production. **(Appendix 5).**

132/33 AIS at Chabua

For the 132/33 kV Air-Insulated Substation (AIS) at Chabua, AEGCL received **3.62 hectares** of land from Amalgamated Plantations Pvt. Ltd., located within the Chabua Tea Estate under the Chabua Revenue Circle.

Key site attributes include:

- The land was acquired through a consent-based transfer to enable timely substation development,
- It is free from forest cover, heritage structures, encroachments, or legal complications,
- Proximity to a public road network allows unhindered access for construction and maintenance,
- The transfer did not involve any displacement of tea workers, nor did it affect livelihoods, community infrastructure, or traditional practices.

The land was formally transferred on **17.10.2022**. Chabua Tea Estate has a total grant area of **1307.76 hectares**, with **760.42 hectares** under tea plantation. The **3.62-hectare** land parcel was adjusted within other unutilized grant areas of the estate, without compromising productivity or estate operations. **(Appendix 7)**

Although no formal multi-site study was undertaken, AEGCL conducted Environmental and Social Due Diligence at both locations, confirming that:

- Sites are free from ecological sensitivity,
- There is no requirement for resettlement or private land acquisition beyond tea estate consent,
- Road access and grid connectivity are feasible,
- Both locations pose low environmental and social risks.

5.4 Assessment of Hypothetical Alternative Sites

A comparison of the selected tea estate lands with hypothetical alternatives (such as private residential plots or forest land) is provided below:

Criteria	Hypothetical Alternative Site	Selected Tea Estate Land
Land Ownership	Private/Forest	Private (Tea estate)
Land Acquisition Requirement	Yes	Yes (negotiated settlement)

Criteria	Hypothetical Alternative Site	Selected Tea Estate Land
Resettlement Risk	Medium to High	None
Environmental Sensitivity	Uncertain	Low (screened)
Grid Connectivity Feasibility	Uncertain	Technically feasible

This comparison confirms that the chosen sites are environmentally, socially, and technically more viable than other potential alternatives.

5.5 Technology Alternatives

For the Titabor substation, Gas-Insulated Substation (GIS) technology has been selected due to:

- Limited land availability within the tea estate area,
- GIS allowing for compact design, reducing land footprint,
- Proximity to urban settlements where space optimization is critical,
- Reduced maintenance and higher reliability in humid or polluted environments.

In contrast, the Chabua substation is being developed as an Air-Insulated Substation (AIS) due to:

- Availability of adequate open land within the tea estate,
- Lower capital cost compared to GIS,
- AIS being consistent with AEGCL and CEA standards for rural or semi-urban settings.

Thus, the technology choices were made based on a balance between technical requirements, cost, and site constraints.

5.6 Conclusion

While formal multi-site evaluations were not conducted due to direct land allocations, AEGCL has ensured that environmental and social screenings were carried out as part of due diligence. The selected sites are:

- Free from forest cover, encroachments, and resettlement needs,
- Technically suited for substation construction and grid integration,
- Accessible by road and not environmentally sensitive.

The adoption of GIS at Titabor and AIS at Chabua reflects appropriate technology selection based on land constraints and cost considerations. Overall, the project design and site choices align with AIIB's ESF requirements and demonstrate a commitment to environmentally and socially responsible infrastructure development.

Chapter 6: Assessment of potential environmental and social impacts, its significance and mitigation measures

6.1 Introduction

This chapter provides a comprehensive assessment of the potential environmental and social impacts associated with the construction of the proposed **132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS at Chabua**. The assessment is based on a detailed understanding of the existing environmental and socio-economic baseline conditions, established through a combination of primary field surveys and secondary data analysis in alignment with applicable statutory and regulatory requirements, as well as the Environmental and Social Standards (ESSs) of AIIB.

The assessment focuses on the physical, biological, and socio-economic components of the proposed subproject area and evaluates potential risks and impacts across all phases of both subprojects—pre-construction, construction, and operation. It identifies likely anticipated impacts and proposes mitigation measures in accordance with the mitigation hierarchy: avoidance, minimization, mitigation, and compensation or offset for any residual impacts. A **Site-specific Environmental and Social Management Plan (ESMP)** has also been developed for these two subprojects and is presented in **section 7.1** of this chapter. This ESMP outlines the mitigation and monitoring measures, along with corresponding institutional responsibilities, to ensure effective implementation and compliance throughout the both subprojects lifecycle.

The methodology adopted for this assessment includes the following key steps:

- **Identification and evaluation** of the range and severity of potential environmental and social impacts across all subproject phases;
- **Recommendation of viable, cost-effective, and environmentally sound mitigation measures** to address the identified impacts; and
- **Formulation of a comprehensive site-specific ESMP** that integrates the proposed mitigation measures into a structured and actionable implementation framework.

6.2 Assessment of Impact Significance

The assessment of impact significance involves evaluating the potential environmental and social impacts of the both proposed subprojects in terms of their type, scale, duration, frequency, extent, and likelihood. This process is essential to prioritize impacts based on their severity and to inform the design of appropriate mitigation measures. The significance of each identified impact is determined by considering both the **magnitude** of the impact and the **sensitivity/vulnerability/importance** of the affected environmental and social receptors.

Magnitude refers to the intensity or scale of the predicted change affecting a specific environmental or social resource/receptor as a result of the impact and categorized as ***Negligible***, ***Small***, ***Medium***, **or** ***Large***. The **sensitivity/vulnerability/importance** of a receptor indicates its ecological, social, or economic importance and its capacity to absorb or tolerate change and categorized as ***Low***, ***Medium***, **or** ***High***. By combining these two parameters, the **significance of each impact** is determined qualitatively in the relevant sections of the report. The evaluation framework is summarized as follows:

Table 21 : Impact Significance Evaluation Matrix

		Sensitivity/Vulnerability/Importance of Receptor		
Magnitude of Impact		Low	Medium	High
	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Thus, the impact significance was determined and following ratings are assigned: ***Negligible, Minor, Moderate, and Major***. This significance rating matrix is applied uniformly across all receptors and associated impacts, as receptor-specific considerations are already incorporated into the determination of magnitude and sensitivity. It is also important to note that impact prediction and evaluation takes into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the subproject design, regardless of the results of the impact assessment process).

Table 22: Context of Impact Significance

Interpretation/Context of Impact Significance			
Negligible	**Minor**	**Moderate**	**Major**
An impact of ***negligible*** significance is one where a resource/ receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.	An impact of ***minor*** significance is one where a resource/ receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards/ guidelines.	An impact of ***moderate*** significance has an impact magnitude that is within applicable standards/guidelines, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is '*as low as reasonably practicable*' (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.	An impact of ***major*** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of impact assessment is to get to a position where the subproject does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the subproject.

6.3 Impact Mitigation Strategy

Once the significance of an impact has been characterized, the next step was to evaluate what mitigation and enhancement measures are warranted. For the purposes of this IA, AEGCL adopted the following Mitigation Hierarchy:

- **Avoid at Source, Reduce at Source**: avoiding or reducing at source through the design of the subprojects.
- **Abate on Site**: add something to the design to abate the impact.
- **Abate at Receptor**: if an impact cannot be abated on-site then control measures can be implemented off-site.
- **Repair or Remedy**: some impacts involve unavoidable damage to a resource (e.g. vegetation and crop land and tree loss due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.
- **Compensate in Kind, Compensate Through Other Means**: where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of access, recreation and amenity spaces etc.).

The primary focus of mitigation was to first apply measures at the source of the impact—aiming to avoid or reduce the magnitude of the impact arising from project activities. Once all reasonably practicable source-level mitigations had been implemented, the remaining residual effects on the affected resources or receptors were addressed through on-site abatement, off-site measures, or compensatory actions, in order to further reduce the overall significance of the impact.

6.4 Environmental and Social Impacts and Mitigation Measures

6.4.1 Impact on Physical Environment

This section evaluates the potential impacts of construction and operation activities on the physical environment, including land use, soil quality, air quality, water resources, and ambient noise levels. The assessment considers both short-term construction-phase impacts and long-term operational-phase implications, and recommends suitable mitigation measures to ensure compliance with environmental standards and minimize any adverse effects.

A. Impacts during Pre-Construction and Construction Phase

Land use and Land Cover	
Context and receptor	• The proposed 132/33 kV GIS at Titabor is located within the Letekujan Tea Estate, while the 132/33 kV AIS at Chabua is situated within the Chabua Tea Estate, both of which are well-established plantation areas in Assam. • The substation sites are situated on fairly plain terrain, which facilitates construction activities and minimizes the need for extensive land contour modifications. • The closest residential settlements situated roughly 200–300 meters from both the site boundaries. Individual houses are sparsely distributed in the vicinity, with no dense habitation directly adjacent to the both substation footprints. • No major anthropogenic activities are observed in the vicinity of the proposed sites apart from tea cultivation and associated estate operations, indicating relatively low human disturbance and development. • The proposed development will lead to a change in land use pattern within the substation footprint,

Land use and Land Cover	
	as tea estate land will be converted into infrastructure land for power transmission purposes.
Embedded measures	• Substation layout is designed to fit entirely within the acquired land from the tea estates, minimizing disruption beyond the required footprint. • Temporary construction-related activities (e.g., vehicle movement, storage, accommodation) will be confined to the substation premises to avoid disturbance to the surrounding tea cultivation area. • Use of existing roads for accessibility.
Impact Significance	The land area for both substations will undergo a permanent land use change from tea estate (plantation) to power infrastructure. As the land are already a managed and cultivated area (not forest or ecologically sensitive), and the change is confined to a limited area with minimal broader land use disruption, the **magnitude** of impact is considered **medium**. The **sensitivity** of the receptor (tea estate land) is **low** from an ecological standpoint. Based on the Impact Significance Matrix, the overall impact **significance** is assessed as ***minor***.
Additional mitigation measures	• Preservation of topsoil during site preparation for reuse in greenbelt development or internal landscaping. • Avoiding spillage of construction materials and waste onto the adjacent plantation area by ensuring secure on-site storage. • Coordination with tea estate management to ensure activities do not interfere with ongoing estate operations. • Post-construction site restoration (wherever feasible), including greenbelt development at substation periphery using native species.
Residual impact significance	Since the proposed activity involves a permanent conversion of land use from tea plantation to substation infrastructure, the impact remains irreversible. Although the footprint is limited and mitigation measures have been embedded and proposed, the nature of the change itself does not alter. Therefore, the residual impact significance remains classified ***Minor*** as, but it is considered acceptable and justified within the scope of planned power infrastructure development.

Soil Environment	
Context and receptor	• The proposed substation locations at Titabor (Letekujan Tea Estate) and Chabua (Chabua Tea Estate) are located in areas with alluvial soil, typically found in tea-growing regions of Assam. These soils are generally loamy to clayey, with moderate to good fertility, suitable for plantation crops. • The terrain is fairly level, reducing erosion risks but susceptible to compaction and contamination during construction if not managed properly. • No major industrial activity is reported in the surrounding area, indicating that the existing soil quality is relatively undisturbed. • Tea estates rely on well-maintained soil health for crop productivity. • Soil disturbance and erosion due to site clearance, excavation, and levelling during pre-construction and construction phases. • Risk of soil contamination from accidental spills of fuel, oil, lubricants, and hydraulic fluids from machinery. • Potential soil pollution from mismanaged construction and demolition (C&D) waste like concrete debris, scrap metal, and packaging materials. • Contamination risk from domestic waste (e.g., food scraps, plastics, cans) generated by construction workers and labour camps. • Degradation of soil quality due to unplanned storage of construction materials (sand, gravel) directly on exposed or fertile soil, increasing sediment runoff.
Embedded measures	• Limiting excavation to the defined project footprint to avoid unnecessary soil disturbance and limiting excavation to the defined project footprint to avoid unnecessary soil disturbance. • Ensuring runoff management structures are in place to prevent sediment transport from stockpiles or exposed surfaces during construction. • Prohibiting waste and chemical spillage on bare soil; temporary storage to be done on impermeable surfaces.

Soil Environment	
	• Integration of landscape restoration measures in the masterplan.
Impact Significance	The construction and civil works associated with the proposed 132/33 kV GIS at Titabor and 132/33 kV AIS at Chabua, such as site clearance, excavation for foundations and trenches, and equipment installation, will lead to localized soil disturbance, compaction, and potential erosion, particularly during the monsoon season. Although the total land area affected is relatively small and all activities are confined within the designated substation boundaries, the physical disruption of the soil profile is inevitable. Given the limited project footprint, the **magnitude** of impact is assessed as **small**. However, the sensitivity of the **receptor** is considered **medium**, since the project sites are located within tea estates, where the soil holds agronomic significance and supports long-standing plantation activities. As a result, the overall impact **significance** on the soil environment before mitigation is assessed as ***minor***.
Additional mitigation measures	• All excavation activities shall be strictly confined to designated and marked construction zones to prevent unnecessary disturbance to surrounding soil areas. • Excavated soil shall be stored within the project boundary in designated locations and reused for backfilling purposes, following IS 1200 (Part 1): 1992 guidelines for earthwork measurements and reuse practices. • Where topsoil is removed for leveling or foundation works, it shall be stored separately in clearly demarcated heaps (not exceeding 2 meters in height) and covered using tarpaulin or geo-textile to prevent erosion. This preserved topsoil shall be reused for greenbelt development or landscaping after construction. • Upon completion of construction, all surplus excavated material and leftover construction debris shall be cleared from the site and disposed of at authorized locations, identified in consultation with local Urban Local Bodies (ULBs) or Panchayat authorities, in line with the Construction and Demolition Waste Management Rules, 2024. • Spill containment kits shall be made available at key construction zones and vehicle fueling areas. In the event of an oil or fuel spill, absorbent materials shall be used for immediate containment, and the contaminated soil will be collected and disposed of in accordance with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. • Clearly marked waste bins shall be placed at labour accommodation areas to enable segregation of biodegradable and non-biodegradable domestic waste. The collected waste shall be disposed of through authorized municipal channels or as per locally approved mechanisms. • Wherever feasible, existing access roads shall be utilized for transporting materials and equipment to the substation site. This will help prevent unnecessary vehicular movement on agricultural or plantation land, thereby minimizing soil compaction and crop damage.
Residual impact significance	Despite embedded and additional mitigation measures, minor, localized soil degradation and permanent loss of soil productivity within the project footprint will occur due to civil structures and compaction. Thus, residual impact significance remains ***Minor***, but acceptable within the scope of planned infrastructure development.

Ambient Air Quality	
Context and receptor	Ambient air quality at the substation sites in Letekujan Tea Estate (Titabor) and Chabua Tea Estate (Chabua) may be temporarily impacted during the construction phase due to the following sources: • Fugitive dust emissions from excavation, drilling, backfilling, and vehicular movement. • Emissions from operation of construction machinery and diesel generator (DG) sets. • Dust from transportation and handling of raw materials such as sand, soil, and aggregates. Monitoring data reveals that the baseline concentrations of PM_{10} and $PM_{2.5}$ are within the permissible limits prescribed by National Ambient Air Quality Standards (NAAQS), while they exceed the more stringent World Health Organization (WHO) guidelines. This discrepancy highlights the distinction between regulatory standards that accommodate socio-economic feasibility (NAAQS) and those founded on strict epidemiological evidence (WHO AQGs, 2021). Such exceedances are typical in Indian semi-urban

<table>
<tr><th colspan="2">Ambient Air Quality</th></tr>
<tr><td></td><td>settings, primarily due to cumulative emissions from vehicular traffic, biomass burning, unpaved roads, and local anthropogenic sources.

A receptor-based impact assessment identifies the presence of sensitive receptors within a 500-meter radius of both the proposed the substation sites. No environmentally sensitive receptors (like schools, hospitals, or protected areas) have been identified within 500 meters of either substation. However, a few scattered habitations lie in proximity.

<table><tr><th>Sensitive Receptors within 500m from 132/33kV GIS at Titabor</th><th>Sensitive Receptors within 500m from 132/33kV AIS at Chabua</th></tr><tr><td>• Residential areas at an aerial distance ranging from 168.17m to 465.32m</td><td>• Residential areas at an aerial distance ranging from 266.86m to 500.00m</td></tr></table>
The project sites are not located within or adjacent to any Protected Area (PA), Eco-Sensitive Zone (ESZ), or Critical Habitat.</td></tr>
<tr><td>Embedded measures</td><td>The EPC Contractor’s tender documents include pollution control clauses, mandating air quality protection through:
• Strategic placement of any temporary facilities (e.g., avoiding upwind locations near habitations).
• Mandatory use of low-emission diesel generators and compliance with CPCB norms.</td></tr>
<tr><td>Impact Significance</td><td>Construction-phase activities such as excavation, material transport, and operation of machineries and vehicles are expected to generate fugitive dust and emissions, potentially affecting nearby receptors and tea plantations. Dust settling on the surface of tea leaves can interfere with photosynthesis, clog stomata, and reduce leaf quality, particularly for fine plucking standards required for premium tea. However, the overall impact would depend on proximity to the substation site, duration of construction, wind direction, and existing vegetation buffers. If unmitigated, this may lead to a temporary reduction in yield and quality, potentially affecting market value.
Given the nature and intensity of construction-related activities, the magnitude of impact is assessed as medium. However, the sensitivity of the receptor environment is considered medium, as the project sites are located within tea estate lands characterized by tea plantations and sparse residential presence and no nearby protected areas or ecologically sensitive zones. Based on this assessment and applying the impact significance matrix, the overall significance of impact on ambient air quality is categorized as moderate.</td></tr>
<tr><td>Additional mitigation measures</td><td>• Maintaining all construction vehicles and machinery in good working condition with valid PUC (Pollution Under Control) certificates, and restricting unnecessary idling of vehicles.
• Dampening unpaved access roads and active work areas with water sprinklers during dry and windy conditions to control dust emissions.
• Covering all loose construction materials such as sand and aggregates during transport and storage to prevent dust dispersion.
• Using tarpaulin covers for transport vehicles carrying fine construction materials like soil, sand, and cement, and preventing overloading.
• Scheduling dust-generating activities during non-harvest periods where feasible, and maintaining a minimum buffer distance between construction zones and tea cultivation areas.
• Installation of green netting/dust barriers around the construction site and along the plantation boundaries.
• Using silent and low-emission diesel generator (DG) sets with stack height conforming to CPCB norms to ensure adequate emission dispersion.
• Limiting vehicle speed to less than 20 km/h within the construction site to reduce dust generation.
• Encouraging the use of low-emission or electric-powered equipment where feasible.
• A functional grievance mechanism will be maintained throughout construction stage, to address the air quality and dust-related concerns. The mechanism will include a clear process for recording, evaluating, and resolving complaints in a time-bound and transparent manner. Consultations will be conducted with the concerned affected communities for the dissemination of the GRM including the</td></tr>
</table>

Ambient Air Quality	
	distribution of flyers, posters etc. on monthly basis.
Residual impact significance	After implementation of mitigation measures, significance of residual impacts for construction activities will also be ***Minor***. The overall air quality is not anticipated to breach the National Ambient Air Quality Standards (NAAQS) at or beyond the project boundary during construction.

Acoustic Environment	
Context and receptor	The proposed construction of 132/33 kV GIS at Titabor and 132/33 kV AIS at Chabua will involve multiple noise-generating activities, including the operation of construction machinery, diesel generator (DG) sets, excavation equipment, and transportation vehicles. These activities are expected to elevate ambient noise levels in the immediate vicinity of the substation sites. Baseline ambient noise quality monitoring was conducted as part of the ESIA study at both subproject locations. The recorded values were found to be within permissible limits as prescribed by the Central Pollution Control Board (CPCB) and WHO, indicating a low pre-existing noise environment. There are no environmentally sensitive receptors such as hospitals, schools, or protected areas located within 500 meters of either substation. However, scattered human habitations exist in the proximity of both project locations. ***Sensitive Receptors within 500m from 132/33kV GIS at Titabor***: • *Residential areas at an aerial distance ranging from 168.17m to 465.32m* ***Sensitive Receptors within 500m from 132/33kV AIS at Chabua***: • *Residential areas at an aerial distance ranging from 266.86m to 500.00m* The subproject sites are not located within or adjacent to any Protected Area (PA), Eco-Sensitive Zone (ESZ), or Critical Habitat as per current notifications.
Embedded measures	• Restriction of construction activities to daytime hours only (6:00 AM to 6:00 PM). • Avoidance of unnecessary honking of vehicle horns near the construction site.
Impact Significance	Construction-phase activities such as the operation of heavy machinery, DG sets, and vehicle movement will result in elevated noise levels, which may temporarily disturb nearby habitations. • **Magnitude** of Impact: **Medium**, due to localized yet consistent noise emissions from heavy equipment and transport vehicles over a limited area. • **Sensitivity** of Receptors: **Medium**, considering the presence of human settlements nearby (though scattered), but absence of high-sensitivity receptors such as hospitals or schools. • Overall **Significance**: ***Moderate***, based on the Impact Significance Matrix
Additional mitigation measures	• Regular maintenance of machinery, including lubricating moving parts, tightening loose components, and replacing worn-out parts. • Shut down or throttle down of machinery and equipment when not in use, especially during non-working hours. • Use of low-noise equipment as far as practicable to minimize noise generation. • Reducing the number of equipment operating simultaneously whenever possible. • Use of diesel generator sets fitted with acoustic enclosures to control noise emissions. • Minimizing the use of vehicle horns within the project area to reduce unnecessary noise. • Restriction of noisy construction activities to daytime hours (e.g., 6 AM to 6 PM) • Providing hearing protection (ear plugs or earmuffs) to workers exposed to high noise levels. • A functional grievance mechanism will be maintained throughout construction stage, to address the noise-related concerns. The mechanism will include a clear process for recording, evaluating, and resolving complaints in a time-bound and transparent manner. Consultations will be conducted with the concerned affected communities for the dissemination of the GRM including the distribution of flyers, posters etc. on monthly basis.
Residual impact	After implementation of mitigation measures, **significance** of residual impacts for construction activities will be ***minor***.

Acoustic Environment	
significance	

Water Resources and Quality	
Context and receptor	• The proposed substation sites are classified under the "safe" category according to the Aquifer Mapping and Management Plan for Jorhat and Dibrugarh district, indicating no critical stress on groundwater resources. • Local communities surrounding the project area depend primarily on groundwater, accessed via tube wells and borewells, for domestic and drinking water needs. • A natural stream is located approximately 550 meters from the proposed substation boundary of 132/33kV GIS at Titabor. • The Sesa Noi River flows approximately 281 meters from the proposed substation boundary of 132/33kV AIS at Chabua. • There is no history of flooding or seasonal overflow of any nearby water bodies at either site. • These water bodies and groundwater resources constitute the primary receptors potentially affected by project activities.
Embedded measures	• Avoidance of storage of construction materials on nearby tea plantation land, agricultural land and near water bodies including canals and drainage lines. • Provision of access to safe and clean water for bathing, washing, and cooking at labour camps. • Domestic wastewater generated at labour camps shall be managed through septic tanks and soak pits. • Prohibition of direct discharge of wastewater or stormwater into canals or nearby water bodies without treatment or sedimentation. • Storing of construction chemicals (cement, paints, oils, anti-termite solutions) on impervious surfaces with secondary containment.
Impact Significance	The proposed project sites are located within groundwater-safe zones, which significantly reduces the risk of groundwater depletion arising from construction activities. Moreover, the implementation of embedded mitigation measures, particularly those concerning wastewater management and the careful handling of construction chemicals, effectively lowers the potential for contamination. However, the proximity of a natural stream near the Titabor site and the Sesa Noi River near the Chabua site, combined with the dependence of local communities on groundwater, means that the receptors in the area are of **medium sensitivity**. Considering these factors, the overall **magnitude** of impact on water resources is assessed to be **Low**. Consequently, the impact **significance** on the water environment during the construction phase is classified as ***minor***.
Additional mitigation measures	• Sensitization of construction workers on water conservation practices and monitoring of water use for optimal consumption. • Regular inspections to detect and repair leakages in water supply lines, construction hoses, or tanker connections. • Design and implementation of a temporary drainage system at the construction site to channel all surface runoff from material storage areas, equipment yards, and excavated zones into sedimentation tanks before safe discharge. • Reuse of treated water from sedimentation tanks or soak pits for dust suppression, equipment cleaning, or curing to reduce freshwater demand. • Engagement of licensed contractors for the collection, treatment, and disposal of sludge or hazardous waste, in accordance with the Hazardous Waste Management Rules, 2016. • Ensuring fuel, oils, paints, and chemicals are stored in bunded enclosures under roofing to localize any accidental spills or leakages. • Spill containment kits shall be made available at all construction zones and fueling areas. In the event of an oil or fuel spill, immediate clean-up will be conducted using absorbent materials, and the contaminated soil will be disposed of in line with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. • Restriction of vehicle and machinery movement near irrigation canals and ensure that drainage patterns are not obstructed during construction.

Water Resources and Quality	
Residual impact significance	After implementation of mitigation measures, **significance** of residual impacts for construction activities will also be ***minor***.

Drainage	
Context and receptor	• The subproject sites are susceptible to considerable surface runoff, particularly during the monsoon season, which can lead to localized flooding, erosion, and siltation of nearby natural water bodies, and tea gardens. • The 132/33 kV GIS substation site at Titabor is located approximately 550 meters from a natural stream, while the 132/33 kV AIS substation at Chabua lies approximately 281 meters from the Sesa Noi River. However, There is no history of flooding or seasonal overflow of any nearby water bodies at either site. • Natural drainage patterns in these regions play a key role in maintaining soil moisture, irrigation flow, and ecological stability.
Embedded measures	• A stormwater drainage system is proposed to effectively collect and channelize rainwater runoff within the site, minimizing waterlogging and erosion risks. • Site grading and contouring will be done to guide stormwater away from critical infrastructure and avoid stagnation.
Impact Significance	However, with embedded measures like stormwater drainage planning and proper site grading, the **magnitude** of impact is assessed as ***small***. However, the proximity of functional water bodies like streams and rivers, raises the **sensitivity** of the receptors to **medium**. Therefore, the overall **significance** of the impact on the surface water environment is considered ***minor***.
Additional mitigation measures	• Minimum alteration of the natural drainage pattern by aligning construction with existing contours and using permeable surfaces wherever feasible. • Construction of temporary diversion dykes or bunds around excavation sites, especially during the monsoon season, to prevent runoff carrying silt and debris. • Restriction of all construction activities within the approved construction footprint to prevent unnecessary soil compaction or obstruction of natural runoff paths. • Periodical cleaning and inspection of stormwater drains and sedimentation structures to maintain functionality throughout the construction period. • Discharge from the site will be routed through sedimentation tanks or silt traps before being allowed to flow into the natural drainage system to ensure that no significant sediment or pollutants enter the irrigation canal.
Residual impact significance	After implementation of mitigation measures, **significance** of residual impacts for construction activities will also be ***minor***.

B. Impacts during Operation Phase

Soil Environment	
Context and receptor	• During the operation phase, employees/workers will be deployed at the substation, working in shifts. Food waste, packaging, and sanitary waste from staff areas, if improperly disposed, may cause localized soil and groundwater contamination through leachate generation. • Used/spent oil and oil-soaked cotton, rags, and filters from equipment maintenance can contaminate soil if not properly handled and disposed of. • Scrap Metal and Insulated Copper/Aluminium Wires: From replacement of conductors, cables, and bus bars. • Waste Gas Insulated Equipment Components: Including damaged/obsolete GIS modules containing SF_6 gas and associated residues. • Though Sulphur Hexafluoride (SF_6) is a gas, accidental leaks or emissions during GIS maintenance can result in formation of by-products (e.g., SO_2, HF, SOF_2) that may settle on soil surfaces and react with

Soil Environment	
	moisture, leading to acidification and soil degradation.
Embedded measures	• Spent transformer oil and lubricants will be collected and stored in leak-proof containers and regularly disposed of through approved vendors. • SF_6 retrieving and filling equipment will be used to ensure gas is recovered and reused without release. Routine leak checks and preventive maintenance will be carried out.
Impact Significance	During the operation phase, the types and volume of waste generated are limited and localized, with appropriate mitigation measures in place such as secure waste handling and SF_6 management. While there is potential for localized soil contamination if these are mismanaged, the embedded controls significantly reduce the likelihood. Hence, the **magnitude** of impact is assessed as ***small***. Given the substations' controlled operational environment and distance from sensitive receptors, the receptor **sensitivity** is considered ***low***. Therefore, the overall impact **significance** on soil during the operation phase is assessed as ***negligible***.
Additional mitigation measures	• Ensure hazardous waste such as used oil, oil-soaked rags, and filters are properly labelled and stored on an impervious surface under a covered shed with secondary containment to prevent leaks and spills. • Carry out regular disposal of hazardous waste through authorized vendors in compliance with the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, and maintain proper documentation and records. • Dispose of e-waste and used/discarded batteries in accordance with the E-Waste Management Rules, 2022 and Battery Waste Management Rules, 2022 through authorized recyclers. • Provide and maintain spill control kits at key operational and maintenance locations to effectively contain and clean up minor leaks or spills. • Staff will be trained in hazardous material handling and spill response. The Standard Operating Procedures (SOPs) for the same is provided in **Appendix 12.**
Residual impact significance	-----

<table>
<tr><th colspan="2">Acoustic Environment</th></tr>
<tr><td>Context and receptor</td><td>• The likely sources of noise during the operation phase of the 132/33 kV GIS substation at Titabor and 132/33 kV AIS substation Chabua are limited to intermittent maintenance and repair activities.
• Continuous operational activities of substations such as electricity transmission through transformers and switchgear do not generate significant noise.

There are no environmentally sensitive receptors such as hospitals, schools, or protected areas located within 500 meters of either substation. However, scattered human habitations exist in the proximity of both project locations.

<table>
<tr><th>Sensitive Receptors within 500m from 132/33kV GIS at Titabor</th><th>Sensitive Receptors within 500m from 132/33kV AIS at Chabua</th></tr>
<tr><td>• Residential areas at an aerial distance ranging from 168.17m to 465.32m</td><td>• Residential areas at an aerial distance ranging from 266.86m to 500.00m</td></tr>
</table>
The project sites are not located within or adjacent to any Protected Area (PA), Eco-Sensitive Zone (ESZ), or Critical Habitat as per current notifications.</td></tr>
<tr><td>Embedded measures</td><td>• All maintenance activities that may involve noise will be conducted only during daytime hours (7 AM – 6 PM).
• Landscaping and plantation along the boundary walls are included in the design to serve as natural noise buffers.
• Substations are designed to operate within secured and enclosed campuses, with boundary walls</td></tr>
</table>

Acoustic Environment	
	that naturally suppress propagation of sound beyond the premises.
Impact Significance	During regular operation, both the proposed substations do not produce substantial noise, as transformers and switchgear operate silently or within permissible limits. Occasional noise from routine maintenance, such as use of power tools or vehicle movement, is infrequent and short-term. Since the substations are enclosed within boundary walls and designed to comply with noise control norms, the **magnitude** of impact on the surrounding acoustic environment is **small**. Despite the presence of sensitive receptors, due to low-frequency and low-intensity activities, the **receptor** sensitivity is also **low**. Hence, the overall impact **significance** is assessed as **negligible**.
Additional mitigation measures	No additional mitigation is proposed beyond the embedded measures, as the expected noise levels are minimal and well-controlled under standard substation operational conditions.
Residual impact significance	---

Visual Impacts	

Context and receptor	• The 132/33 kV GIS substation at Titabor is located within the Letekujan Tea Estate, and the 132/33 kV AIS substation at Chabua is located within the Chabua Tea Estate, both being long-established and visually harmonious plantation landscapes.
	• Visual impacts during the operation phase will be experienced by two main receptor groups:
	  ◦ Local residents and plantation workers who live or work within close proximity to the substations and will have a permanent line of sight to the infrastructure.
	  ◦ Pedestrians and motorists using adjacent tea garden roads, who will experience temporary or passing views of the substation facilities.

Embedded measures	• The project design incorporates landscaping and visual screening, including the plantation of native trees and ornamental shrubs around the substation boundary to blend with the tea garden landscape. • Perimeter fencing and solid compound walls are included in the design to obscure internal equipment and reduce industrial visual elements from public view.
Impact Significance	Given the limited scale of the substations, the presence of embedded visual buffers such as perimeter fencing and landscaped green belts, and the relatively low visual sensitivity of the surrounding tea estate environment, the **magnitude** of visual impact is assessed as **small**. The receptor **sensitivity** is considered **low**, as most views of the substations will be either transient, experienced briefly by-passing pedestrians and motorists, or observed by residents already accustomed to similar utility structures within this semi-industrial plantation setting. Therefore, the overall **significance** of the visual impact during the operation phase is assessed as ***negligible***.
Additional mitigation measures	• Design and install aesthetically designed entrance and signage that aligns with the surrounding rural landscape. • Implement vertical and horizontal greening on boundary walls (e.g., creepers or green mesh). • Engage local community or local forest department to assist in selecting appropriate native species for plantation. • Maintain green belt regularly to ensure it remains effective as a visual barrier. • Install minimal, shielded lighting fixtures to avoid light pollution and glare during night-time operation.
Residual impact significance	---

6.4.2 Impact on Ecological and Biological Environment

The construction and operation of the proposed 132/33 kV (2X50 MVA) Titabor GIS and 132/33 kV (2X50 MVA) Chabua AIS will require approximately 1.21 hectares and 3.62 hectares of land, respectively. These sites are situated within the premises of Letekujan Tea Estate and Chabua Tea Estate. Site preparation for both subprojects will involve the clearance of existing vegetation, including tea bushes and the removal of shade trees (*Albizia lebbeck*). This chapter assesses the potential impacts on the local biological environment—including flora, fauna, and ecological features—and outlines measures to minimize or mitigate any adverse effects.

A. Impacts during Pre-Construction and Construction Phase

Impacts due to Vegetation Clearance	
Context and Receptor	Vegetation clearance is an initial activity associated with site preparation, construction of access/internal roads, and excavation for foundations of the both proposed 132/33 kV Titabor GIS and 132/33 kV Chabua AIS. Approximately 6,521 tea bushes and 6 Siris trees (*Albizia lebbeck*) are proposed to be cut within the substation area of Titabor GIS while around 34,416 tea bushes and 92 Siris trees (*Albizia lebbeck*) are proposed to be cut within the substation area of Chabua AIS. The ecological value of the cleared trees is moderate; potential impacts include: • Loss of nesting and roosting sites for local bird species. • Reduction in perching and breeding habitat for arboreal fauna. • Elimination of natural shelter and foraging areas for small reptiles, amphibians and insects. • Decreased shade and microclimatic regulation in the area.
Embedded Measures	• Tree cutting will be limited to only those strictly necessary for construction and safety clearances. • Landscaping is integrated into the project design to restore green cover and visual appeal. • Compensatory plantation of native or ecologically beneficial species should be undertaken, preferably within or near the both subproject areas.
Impact Significance	Although several tea bushes and shade trees are proposed to be cut within the both substation footprint. These tree species are not endemic, introduced, or listed as endangered, indicating no critical impact on rare or threatened flora and are exempted from prior felling permission as per the “Assam Trees Outside Forest (Sustainable Management) Rules, 2022”. The surrounding area also does not fall under any Eco-sensitive Zone, Protected Area, or Critical Habitat. The embedded mitigation measures such as restricted tree felling, and a well-planned landscaping strategy further help reduce the overall adverse effects. Given these factors, the **magnitude** of impact is assessed as ***medium***, with a ***medium*** receptor **sensitivity** due to the presence of common avifauna and small terrestrial species. Hence, the overall impact **significance** is considered ***moderate***.
Additional mitigation measures	• Topsoil from cleared areas will be preserved and reused for landscaping and compensatory plantation activities. • Engage with the Forest Department or local NGOs to ensure the survival of planted saplings and monitor growth for a minimum of 3 years. • Plantation of nectar and fruit-bearing native or ecologically beneficial species to restore habitat value for pollinators and birds. • Creation of green buffer zones around the both substations to serve as refuge for displaced fauna and enhance biodiversity.
Residual Impact Significance	While the impact is limited to the relatively short construction phase of the subprojects, the recovery time to return to pre-project conditions is long and therefore the significance of the residual impacts will remain unchanged, i.e., ***moderate***.

Impacts due to Construction Activities	
Context and Receptor	Construction activities for the both proposed 132/33 kV Titabor GIS and 132/33 kV Chabua AIS—including excavation, movement of machinery, labor influx, and increased anthropogenic presence—have the potential to disturb local habitats and species. Specific concerns include: • Excavation for foundations and ancillary civil works may directly impact burrowing fauna and other small terrestrial mammals, reptiles, amphibians and insects. • Soil disturbance may alter soil structure and chemistry, affecting microhabitats and nearby tea plantations and other vegetative species. • Noise and vibration from construction equipment, transport vehicles, and manual labor can stress fauna and disrupt their natural behavior such as foraging, mating, nesting, and migration. • The temporary presence of laborers may cause additional pressure on the surrounding biological environment due to: ▪ Increased foot traffic in adjacent areas, ▪ Generation of domestic waste that may attract scavengers or degrade habitats, ▪ Unauthorized collection of firewood, timber, or non-timber forest products ▪ Potential disturbance to local fauna through chasing, feeding, or harming animals. • During site visit and community consultations, no sightings of significant wildlife were observed or reported in both subproject sites except some rodents, squirrels etc. Common domestic animals (cattle, goats, dogs, cats) are frequently seen, and avifauna is limited to resident birds like mynas, bulbuls, pigeons, crows, and sparrows. Occasional monkey and snake sightings were reported but are infrequent. • The project site is not located within or adjacent to any Protected Area (PA), Eco-Sensitive Zone (ESZ), or Critical Wildlife Habitat as notified under the Wildlife (Protection) Act, 1972. However, the nearest protected area Hollongapar Gibbon WLS is found at a distance of 8.43 km from proposed 132 kV Titabor GIS site. Consultation with the nearby community do not reveals any sensitivity in terms of Hoolock Gibbon, Stumptailed Macaque or other wildlife movement in the subproject area and is thus less likely to have any adverse impact on the nearby protected areas.
Embedded Measures	• Construction activities are confined to the designated site footprint to minimize habitat disturbance. • Machinery and labor movement is restricted to approved access roads and work zones. • Basic solid waste collection and sanitation facilities are to be provided at labor camp or worksite.
Impact Significance	The **magnitude** of impact from construction activities is considered ***medium***, given the localized nature of the disturbance, potential for noise, vibration, and anthropogenic pressure, and temporary land disturbance. The receptor **sensitivity** is ***low***, as the site is not located within or adjacent to any Protected Area, Eco-Sensitive Zone, or Critical Habitat, and the surrounding biodiversity primarily comprises common resident fauna and domesticated species. Due to the absence of sensitive or threatened species and the implementation of embedded mitigation measures—such as restricting activities to designated areas, providing sanitation facilities, and minimizing off-site disturbances—the overall impact **significance** is assessed as ***minor*.**
Additional mitigation measures	• Avoid construction during early morning and late evening hours to reduce disruption to crepuscular fauna. • Sensitization of workers through environmental awareness programs about the importance of local biodiversity and prohibited actions (e.g., harming or feeding wildlife). • Prohibition of use of open fires and prevent fuelwood collection from nearby vegetation. • Laborers will be instructed to avoid contact with local wildlife and not engage in hunting or tree cutting. • Implementation of solid waste and wastewater management protocols at labor camps and construction sites to avoid indirect impacts on surrounding fauna.
Residual Impact Significance	The implementation of the above mitigation measures will substantially reduce ecological impacts during construction. However, some residual impacts particularly due to noise, human presence, and machinery movement are unavoidable. These are expected to be minor and localized, with temporary disturbance to flora and fauna. Overall, the residual impact significance remains **minor**, considering

Impacts due to Construction Activities	
	the absence of critical habitats.

B. Impacts during Operation Phase

Impacts on biological environment at operation stage	
Context and Receptor	During the operation phase, both the 132/33 kV Titabor GIS and 132/33 kV Chabua AIS substations become controlled and secured facility with restricted access. Routine activities include equipment monitoring, periodic maintenance, and site management. The substation infrastructures are located on previously cleared and developed land, and the human presence is significantly reduced compared to the construction phase.
Embedded Measures	• The substation design includes a compact Gas Insulated Substation (GIS) system that generates minimal noise, reducing disturbance to nearby fauna. • Landscaping with native vegetation is integrated into the subproject. • Access to these substations is restricted and controlled to minimize human disturbance to surrounding habitats. • Vegetation maintenance will be conducted regularly to prevent overgrowth within the site boundary.
Impact Significance	Given that the substation is located on already cleared and developed land and operational activities involve minimal noise, low human presence, and restricted access, the **magnitude** of impact is ***small***. The surrounding biological environment primarily includes common species with no known critical or sensitive habitats, indicating ***low*** receptor **sensitivity**. With embedded mitigation measures such as the use of low-noise GIS equipment and native landscaping, the overall impact **significance** during the operation phase is ***Negligible***.
Additional mitigation measures	• Enhancement of landscaping efforts by planting additional native species around the both substation boundaries to improve habitat quality and act as a natural noise and visual buffer. • Wherever feasibly use of fully shielded, motion-sensor lighting to minimize light pollution and reduce disturbance to nocturnal fauna. • Scheduling of vegetation trimming and grass cutting outside of sensitive periods such as bird breeding seasons to protect ground-nesting species. • Conducting periodic environmental awareness training for operational and maintenance staff to promote biodiversity conservation practices.
Residual Impact Significance	----

6.4.3 Impact on Occupational Health and Safety

A. Impacts during Construction Phase

Impacts on Occupational Health and Safety during Construction stage	
Context and receptor	• The construction of both proposed 132/33 kV Titabor GIS and 132/33 kV Chabua AIS will involve working at heights (e.g., on gantries, structures, and towers), posing significant fall risks. • Commissioning activities will involve working near or on energized equipment and live power lines, creating a risk of electric shock and electrocution. • Civil works, including excavation for foundations, carry risks of trench collapse, falling objects, and equipment-related injuries. • The use of heavy construction machinery (cranes, concrete mixers, dumpers) increases the risk of accidents and physical injuries due to equipment malfunction, collision, or improper handling. • Welding, cutting, and grinding activities during steelwork may expose workers to burns, eye injuries, and inhalation of metal fumes. • Slip, trip, and fall hazards may increase during the monsoon season due to muddy surfaces and

Impacts on Occupational Health and Safety during Construction stage	
	water accumulation. • Handling of construction materials such as cement, chemicals (e.g., solvents, paints), and fuel can pose health risks from exposure, skin contact, and inhalation. • Noise and vibration from equipment may cause hearing damage or long-term occupational stress if not controlled. • Extended exposure to high temperatures, especially in the summer, can result in heat stress, dehydration, and fatigue. • Inadequate sanitation, poor housekeeping, and lack of protective gear may lead to communicable diseases, infections, and general deterioration in worker health. • The engagement of underage or adolescent workers (below 18 years) in construction poses serious safety and welfare risks. Children under 16 are highly vulnerable to exploitation, while those aged 16–18 face potential injury or long-term harm if assigned hazardous tasks such as heavy lifting, work at heights, exposure to chemicals, or night shifts. Their employment may also disrupt education or vocational training. The main receptors are vulnerable adolescents who may be engaged through subcontractors or labor suppliers, particularly during peak construction demand.
Planned measures	• Only trained and experienced workers will be deployed for specialized tasks. • Pre-job safety briefings will be conducted to inform workers about activity-specific hazards and precautions. • Strict adherence to AIIB ESP requirements on child and adolescent labor: no workers under 16 years will be employed; if any workers aged 16–18 are engaged, a risk assessment will be conducted to ensure they are not assigned hazardous tasks (e.g., working at heights, heavy lifting, exposure to chemicals, night work), with safeguards such as age-appropriate tasks, restricted working hours, and continuous supervision. • Erection of steel structures will be performed by workers using safety harnesses, lifelines, and fall arrest systems. • Local community members will be restricted from entering construction zones. • Construction zones will be clearly marked, barricaded, and access controlled. • Use of personal protective equipment (PPEs).
Impact Significance	The **magnitude** of occupational health and safety impacts during both the substations construction is assessed as ***medium***. This is due to the inherent risks associated with working at heights, exposure to live electrical components, heavy lifting, handling of hazardous materials such as cement and welding equipment, and increased likelihood of slip and trip hazards, especially during the monsoon season. The receptor **sensitivity** is ***high***, as construction workers are directly exposed to these risks and any lapse in safety can result in serious injury or even fatality. Considering the medium magnitude of risks and high sensitivity of the workforce, the overall **significance** of the impact is assessed as ***Major***.
Additional mitigation measures	• During peak summer months, work will be scheduled during cooler hours to prevent heat-related illnesses. • Concrete mixing to be carried out in a manner that minimizes dust generation. • A fully equipped First-Aid Box to be maintained at the construction site. • Emergency contact numbers and directions to the nearest hospital to be prominently displayed. • EPC contractor will implement a Health and Safety (H&S) Plan and conduct H&S training for all workers. • H&S performance will be monitored regularly through audits. • Workers will be kept informed about H&S achievements and updates.
Residual impact significance	With implementation of comprehensive occupational health and safety measures—including worker training, proper use of PPE, site-specific safety planning, health monitoring, and emergency preparedness—the risks to workers can be significantly minimized. However, due to the dynamic nature of construction activities and the potential for human error or non-compliance, some residual risk remains. Therefore, even after mitigation, the residual impact is assessed as ***moderate***,

Impacts on Occupational Health and Safety during Construction stage	
	requiring continued vigilance and monitoring throughout the construction period.

B. Impacts during Operation Phase

Impacts on Occupational Health and Safety during Operation stage	
Context and receptor	During the operation stage, both 132/33 kV Titabor GIS and 132/33 kV Chabua AIS substations will be managed by AEGCL. Although these substations will have restricted access and operate under controlled conditions, several occupational health and safety risks are still present for operation and maintenance personnel. These include: • Risks of electrical hazards such as arc flash, electrocution, or contact with energized components during maintenance or equipment failure. • Possibility of transformer explosion or fire due to overheating, oil leak, or equipment malfunction. • Risks associated with SF_6 (sulfur hexafluoride) gas leakage from GIS equipment, which can pose asphyxiation hazards in confined spaces and contributes to greenhouse gas emissions if released. • Potential for slips, trips, and falls during maintenance work, especially near cable trenches, equipment platforms, or during rainy conditions. • Emergency response risks in case of natural disasters (e.g., flooding or earthquakes) that may affect substation integrity.
Planned measures	• Only trained and authorized personnel are allowed to enter the substation premises. • A fully equipped and firefighting system will be installed, with fire extinguishers, fire alarms, and suppression systems as per safety norms. • The Gas Insulated Substation (GIS) is designed to minimize exposure to live parts and SF_6 gas leakage risk through enclosed compartments and pressure monitoring systems. • Danger signs and warning labels will be affixed near high-voltage equipment and control rooms. • Basic emergency response and evacuation plans will be in place, and emergency contact numbers will be displayed prominently.
Impact Significance	The **magnitude** of impact during the operation stage is considered ***medium***. While the frequency of worker presence is relatively lower than during construction, the consequences of potential hazards—such as transformer explosions, electrical shocks, GIS gas leakage, or arc flashes—can be severe if unmitigated. These risks are intrinsic to high-voltage installations and maintenance activities, particularly in GIS substations where SF_6 gas leakage poses additional asphyxiation and environmental hazards. The receptor **sensitivity** is ***medium*** because the affected individuals are trained operational staff exposed to high-voltage equipment, hazardous gases, and confined operational environments. Their roles inherently involve exposure to critical safety risks. Considering the **medium** magnitude of impact and **medium** receptor sensitivity, the overall impact **significance** is assessed as ***Maderate***.
Additional mitigation measures	• Standard Operating Procedures (SOPs) for all routine and emergency Operation & Maintenance (O&M) activities at the substation will be prepared and implemented in accordance with the Safety Manual on Transmission System, AEGCL, dated May 12, 2014 (***https://www.aegcl.co.in/wp-content/uploads/2020/12/Safety_Manual_AEGCL.pdf***). • A proper lock-in lock-out (LOTO) protocol will be followed during any repair, maintenance, or servicing activities on substation or transmission infrastructure to ensure safety from accidental energization. • All occupational incidents and accidents will be recorded in a systematic manner, including near-miss events. • For any incident or accident, a detailed root cause analysis (RCA) shall be carried out, and corrective/preventive actions will be taken accordingly. • Periodic safety training and mock drills for all operational staff, including emergency response to electrical accidents, fires, and gas leaks.

Impacts on Occupational Health and Safety during Operation stage	
	• Mandatory use of personal protective equipment (PPE) such as insulated gloves, arc-flash protective suits, helmets, safety goggles, and shoes for maintenance personnel. • Strict procedures for monitoring, handling, and recycling SF_6 gas using leak detection sensors and recovery units. • Preventive and predictive maintenance schedules for transformers, switchgear, and protection systems to reduce malfunction risks. • On-site availability of first-aid kits and trained first responders; nearest hospital contact details displayed. • Installation and regular testing of lightning arrestors and surge protection devices. • Periodic audits of safety systems and performance, with corrective actions implemented promptly. • A transparent system for reporting and investigating near-misses, unsafe conditions, or incidents.
Residual impact significance	With the implementation of mitigation measures the residual impact is reduced to ***Minor***. While some level of occupational risk remains due to the nature of the work, these are manageable through monitoring, training, and preventive practices.

6.4.4 Impact on Socio-economic Environment

A. Impacts during Pre-construction and Construction Phase

Economic Loss to Land owners due to transfer of land for substation construction	
Context and receptor	The proposed sites for the 132/33 kV substations at Titabor and Chabua are located within operational tea estates—Letekujan Tea Estate (managed by M/s Kasojan Tea Company Pvt. Ltd.) and Chabua Tea Estate (under Amalgamated Plantations Pvt. Ltd.), respectively. These lands were transferred to AEGCL through mutual negotiation and coordination with the respective district administrations. At Titabor, an area of 1.21 hectares was transferred to AEGCL, and at Chabua, 3.62 hectares of land was transferred for substation development. In both cases, the land parcels lie within the respective tea estates and were primarily covered with tea bushes, grasses, and scattered vegetation, not used for residential or critical operational purposes. These plots were not associated with labour lines or community infrastructure, and thus, no adverse impact on the daily life or housing of tea garden workers was reported. Letekujan Tea Estate comprises a total grant area of 303.61 hectares, with 229.80 hectares currently under tea plantation, leaving 73.81 hectares as unplanted or reserve land. Similarly, Chabua Tea Estate has a total grant area of 1307.76 hectares, of which 760.42 hectares is planted, and 547.34 hectares remains unplanted. Both estates confirmed that the land transferred to AEGCL represented a small portion of their grant area and that adequate unutilized land was available to manage and compensate for the affected areas. The estate managements have committed to reallocating workforce activities within existing or newly cultivated zones, ensuring there is no reduction in employment, wages, or access to welfare services. (Letter form Garden Authority are Appended in **Appendix 5 and Appendix 7**) Furthermore, no economic loss or displacement was reported among tea garden workers or staff as a result of these land transfers. All labour-related activities have continued without interruption, and the estates have ensured that cultural practices, social customs, and access to public utilities remain unaffected.
Embedded/ in built measures	The compensation provided to the landowners included both crop and zirat compensation, in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Act, 2013. The compensation amounts received from the land transfer have been allocated by both estates toward developing and planting tea in other vacant or underutilized areas, thereby ensuring continuity of operations and employment.

Economic Loss to Land owners due to transfer of land for substation construction	
Impact Significance	As the land parcels for the 132/33 kV substations at Titabor and Chabua have already been transferred to AEGCL and construction is confined within these designated areas, the potential impact on local communities is assessed as negligible. The sensitivity of receptors is considered low, given that the transferred land does not intersect with labour residential areas and community facilities. Furthermore, livelihoods will remain unaffected, as both tea estates possess sufficient unutilized land for ongoing tea cultivation and have committed to using the compensation received for plantation development to ensure continued operational stability. According to the Impact Significance Assessment Matrix, the combination of negligible magnitude of impact and low receptor sensitivity leads to the conclusion that the overall significance of the impact is negligible for both Titabor and Chabua substations.
Additional mitigation measures	No additional mitigation measures have been identified for this impact
Residual impact significance	There is no residual impact anticipated from the land transfer. Moreover, both estate authorities have conveyed that the establishment of the substations will improve power reliability, eliminate dependence on diesel generators, and enhance the efficiency of tea processing operations. These improvements are expected to support higher productivity and long-term operational sustainability, benefiting both the estate management and the worker community.

Impact on cultural, religious, or heritage structures	
Context and Receptor	For both the Chabua and Titabor substation projects, no impact on cultural, religious, or heritage structures has been identified. At Chabua, the proposed substation is located within the premises of Chabua Tea Estate, on land that was previously used for tea cultivation. During public consultation and field verification, it was confirmed that there are no archaeological, religious, or historically protected structures within the vicinity of the proposed site. Similarly, the Titabor substation, located within Karikatia Grant village on land provided by Letekujan Tea Estate, was verified—both through official records and public engagement—as having no cultural, religious, or heritage structures within or near the selected land parcel. The area is not part of any notified heritage zone or protected site under state or national authorities.
Mitigation Measures	Given the absence of any identified structures of cultural, religious, or heritage importance at or near either site, no direct mitigation is currently necessary. However, there remains a remote possibility of chance finds during excavation or construction activities. In the event that any artifacts, structures, or other materials of potential archaeological significance are discovered, all construction work in the immediate vicinity will be halted immediately. The relevant cultural heritage authorities will be notified, and the site will be secured to prevent disturbance. Work will only resume once a qualified expert assesses the find and appropriate measures are taken in accordance with national regulations and heritage protection guidelines. Project personnel will be trained on the chance finds procedure as part of their environmental and social awareness training. This precautionary approach ensures that any unexpected discoveries are handled responsibly and in compliance with applicable laws.
Impact Significance	Given the absence of cultural or heritage assets in the project areas, the potential social impact is considered **negligible to none**.
Additional mitigation measures	As the impact significance is negligible, no additional mitigation measures have been identified for this impact
Residual impact significance	The residual impact significance is expected to remain negligible

Impacts Due to Migrant Labour	
Context and Receptor	For the construction of the 132/33KV (2x50 MVA) GIS Substation at Titabor and the 132/33KV (2x50 MVA) AIS Substation at Chabua a limited number of skilled and semi-skilled migrant labourers may be temporarily engaged for specialized civil and electrical works. However, in order to minimize potential impacts, strong emphasis will be given to the engagement of local labour, especially for unskilled and semi-skilled tasks. This approach not only helps reduce the influx of migrant workers but also promotes local employment and community acceptance. Given that both substation sites are located within tea estates and away from dense residential areas, interaction between migrant labour and the local population is expected to be minimal. Nevertheless, without proper management, there could still be minor risks related to waste generation, pressure on local infrastructure, or cultural friction if labour is not adequately housed and monitored. While the sites are located within tea estates and not in close proximity to major residential clusters, the temporary presence of migrant labour may still pose potential social risks. These include waste generation, strain on local infrastructure, and cultural friction, risks of gender-based violence (GBV), including sexual harassment or misconduct. Although these risks are considered low due to limited community interaction.
Mitigation Measures	To manage these potential impacts, the following mitigation strategies will be adopted: • Local labour will be given preference during contractor hiring, particularly for unskilled and semi-skilled roles, to reduce dependency on migrant workers. • Where migrant labour is unavoidable, designated labour camps will be established near the substation site with proper sanitation, waste disposal, and water facilities. • Health and safety screenings, as well as regular medical support, will be provided to prevent the spread of illnesses. • A code of conduct and cultural sensitization will be introduced to minimize social friction and ensure respectful behaviour. Contractors will be required to follow strict codes of conduct, including specific policies on prevention of sexual harassment, GBV, and respectful behaviour. • Migrant workers will not rely on local public infrastructure (e.g., schools, health facilities, water supply), avoiding strain on community resources.
Impact Significance	The potential social impact from the engagement of migrant labor is assessed to be **Small** as mostly local labour will be use and the labour influx will be minimum. Given that both substation sites are located within tea estates and away from dense residential areas, interaction between migrant labour and the local population is expected to be **Low.** According to the Impact Significance Assessment Matrix, a combination of a ***small*** magnitude of impact with **low** receptor sensitivity leads to the conclusion that the overall **significance** of the impact is ***negligible***
Additional mitigation measures	The contractor will be required to submit a monthly Environmental and Social (E&S) monitoring report, which will also include compliance with labor camp maintenance as per IFC performance standards **(Appendix 13)**, including hygiene, waste disposal, safety, and living conditions. A separate Labor Grievance Register will be maintained to document and address any labor-related complaints.
Residual impact significance	The residual impact significance will remain negligible

Impact on Community Health and Safety	
Context and Receptor	The construction of both the proposed substations at Titabor and Chabua are not expected to have any major adverse impact on community health and safety. Both sites are located within privately owned tea estates (Chabua Tea Estate and Letekujan Tea Estate, respectively), and no residential settlements lie within or immediately adjacent to the substation boundaries. The construction phase may involve typical risks such as increased movement of vehicles and machinery, temporary dust and noise generation, and potential safety hazards due to civil and electrical work. However, the distance from populated areas minimizes direct exposure of the community to these risks. A potential risk also exists if adolescent or underage workers (below 18 years), recruited through subcontractors or labour suppliers, are engaged in construction activities, as this could expose them to unsafe site conditions and compromise their welfare.
Mitigation Measures	To minimize risks to community health and safety, strict access control will be implemented at the substation sites, including fencing, security personnel, and clear warning signage to prevent unauthorized entry. Traffic management plans will be enforced to regulate the movement of heavy vehicles, with designated routes and speed restrictions near residential areas. Dust suppression measures such as regular water sprinkling, dust barriers, green nets and covering of transported materials will be adopted. Noise levels will be monitored and limited to permissible working hours. Public awareness campaigns will be conducted to inform nearby communities about construction activities and safety precautions. Emergency response procedures will be established and communicated to both workers and local authorities to ensure preparedness in case of incidents. Strict enforcement of AIIB ESP requirements will ensure that no workers under the age of 16 are engaged; for those aged 16–18, a risk assessment will be undertaken to confirm they are only assigned to safe, non-hazardous tasks under continuous supervision, with safeguards to prevent disruption to their education or vocational training**.** These measures will help maintain a safe environment for surrounding communities during construction.
Impact Significance	The construction of the substations may pose potential risks to community health and safety, primarily due to increased movement of heavy vehicles and machinery, noise and dust generation, and potential unauthorized access to the construction site. These activities can lead to road safety concerns, minor respiratory issues, and accidental injuries if not properly managed thus the Magnitude of Impact will be **Medium**. However, both sites are located within privately owned tea estates, and no residential settlements lie within or immediately adjacent to the substation boundaries, the overall risk to nearby communities are considered **low**. According to the Impact Significance Assessment Matrix, a combination of a **medium** magnitude of impact with **low** receptor sensitivity leads to the conclusion that the overall **significance** of the impact is ***Minor.***
Additional mitigation measures	Periodic community consultations will be held to address concerns proactively, and a community grievance mechanism will be established to ensure timely resolution of any health or safety-related complaints.
Residual impact significance	The residual impact significance will remain negligible

B. Impacts during Operation Phase

Impact on Community Health and Safety	
Context and receptor	During the operations phase, the substations are expected to have minimal direct impact on community health and safety, as it will be a secured facility with restricted access to authorized personnel only. Potential risks include electrical hazards, such as accidental contact with high-voltage equipment, and noise from transformers and other operational equipment to the near-by community.
Planned	To ensure community safety during operations, the substation will maintain strict access controls with

Impact on Community Health and Safety	
/Implemented Mitigation Measures	secure fencing and surveillance to prevent unauthorized entry. Clear warning signs about electrical hazards will be prominently displayed. Regular maintenance and inspection of equipment will be conducted to minimize noise and prevent electrical faults or leaks. Emergency response plans will be established and coordinated with local authorities. Additionally, ongoing community awareness programs will inform residents about safety precautions and whom to contact in case of emergencies, ensuring a safe environment around the substation throughout its operational life.
Impact Significance	The impact on community health and safety is considered **Negligible** as during the operations phase movement of heavy vehicles and machinery, noise and dust generation will be limited. Moreover, the substation sites will be securely enclosed and access strictly controlled, ensuring that all activities remain safely confined within its boundaries. Restricted entry, implementation of comprehensive safety protocols, and routine maintenance of equipment will collectively minimize the risk of accidents and prevent any potential exposure to electrical hazards for the surrounding community. Noise levels are expected to be low and within permissible limits, further minimizing disturbance. These factors collectively ensure that the substation's operation poses **Low** health or safety risks to nearby residents during the operations phase. According to the Impact Significance Assessment Matrix, a combination of a ***negligible*** magnitude of impact with **low** receptor sensitivity leads to the conclusion that the overall **significance** of the impact is ***negligible.***
Additional mitigation measures	To further reduce potential risks to community health and safety, the project will undertake health and safety awareness programs for the local community, with a focus on electrical safety and emergency preparedness. Special awareness campaigns will be organized in nearby schools to educate children about potential hazards associated with the substation, including clear guidance on do's and don'ts during emergencies. The local community will also have access to the project's established grievance redress mechanism, ensuring concerns are addressed promptly. In addition, periodic engagement with community representatives will be conducted to reinforce safety protocols and share updates. Emergency contact information will be publicly displayed around the facilities, and mock drills may be organized in collaboration with local authorities to enhance community preparedness. These measures aim to build awareness, ensure transparency, and promote long-term safety and trust between the project and surrounding communities.
Residual impact significance	Post the implementation of the mitigation measures, the impact significance is expected to be reduced to negligible.

Chapter 7: Environmental and Social Management Plan (ESMP) & Monitoring Plan (ESMoP) and Budget

7.1 Environmental and Social Management Plan

This chapter outlines the Environmental and Social Management Plan (ESMP) developed to address the identified impacts of the project. It also details the administrative framework required to ensure the implementation of mitigation measures and the monitoring of their effectiveness. The comprehensive Management Plan is presented below.

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
During Pre-Construction Phase[10]								
1.	Site selection, Survey, Alternate analysis	• The substation sites were selected to avoid involuntary resettlement and minimize impacts on landowners. As suitable government land was unavailable, AEGCL acquired 1.21 hectares from Letekujan Tea Estate in Titabor and 3.62 hectares from Chabua Tea Estate (Amalgamated Plantations Pvt. Ltd.) through mutual negotiation with the respective owners.	Substation land	• Loss of tea garden lands. • Encroachment into farm land, Loss of garden productivity and Impact on livelihood. • Marking of 98 nos. of Siris trees and 40937 nos. of tea bushes resulting in removal of vegetation and potential bird/insect habitat loss. • Disruption of microhabitats and nesting sites, reducing local ecological diversity. • Possible erosion due to disturbance of natural contours.	• Compensation to the tea estates owners made under the provisions of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. All kind of structures were avoided by selecting land parcels from less-productive sections of tea estates, ensuring no displacement of any residential or	PIU /EPC Contractor	PMC, PIU & PMU (AEGCL)	Once during substation siting survey and design

[10] *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
		• Mapping of elevation, slope, and land features for substation layout planning. • Identification of soil types and stability for determining appropriate foundation design. • Marking zones for digging of pits for equipment, buildings, and support structures. • Selection of locations within the site for safe storage of construction materials without impacting vegetation or drainage. • Identification and tagging of tea bushes and trees that may require felling due to construction needs. • Identification of routes within the site for construction traffic and equipment movement.		• Risk of minor encroachment on adjoining land if boundary is not well established.	community structures. • Encroachment into farmland and loss of garden productivity were avoided by selecting less-productive sections within tea estates at both Titabor and Chabua. Tea estate owners committed to adjusting cultivation to other areas within their estates, ensuring no impact on farmland, overall productivity, or worker livelihoods. • To mitigate this risk, secure fencing and controlled access measures will be implemented around the construction site. • Felling limited to essential trees; prior approval to be obtained from Forest Department, if required.			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		• Establishment of substation boundary to avoid encroachment on adjacent garden land.			• Plantation of native, nectar and fruit bearing species to restore habitat value at post-construction stage. • Topsoil from cleared areas to be preserved and reused for plantation and landscaping. • Regular sprinkling of water to minimize dust. • Installation of green netting/dust barriers around the construction site and along the plantation boundaries. • Construction-related activities confined within the project boundary; surrounding areas to be avoided. • For plantation maintenance and monitoring for at least 3 years post-plantation.			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
2.	Development of baseline	• Collection of air, surface water, groundwater, soil, and noise samples at receptor level.	In the vicinity of Substation Land (500 m)	• Minor and temporary disturbance to local soil or vegetation at sampling points. • Temporary noise from sampling equipment or movement of monitoring team. • Possible minor disturbance to local residents or fauna due to sampling activities.	• Sampling to be conducted using standard protocols with minimal disturbance to the site. • Restoration of any disturbed soil or vegetation after sampling. • Information to local residents or stakeholders prior to sampling.	EPC Contractor (through NABL accredited /PCB (Assam) approved laboratories)	PMC, PIU & PMU (AEGCL)	Witness during sampling
3.	Substation Layout & Design and site preparation	• Development of benches inside the substation through strategic cutting and filling to allow equipment placement and voltage-level segregation. • Conducting detailed topographic survey and preparation of a Site Grading Plan. • Designing internal roads, pathways, and entry/exit points for smooth vehicular and	Substation site	• Disturbance of soil layers leading to erosion and siltation risks during excavation and embankment activities. • Dust generation due to clearing, grading, and vehicular movement, affecting air quality. • Potential alteration in local hydrology due to modification of natural drainage paths. • Generation of noise and vibration from heavy machinery and compaction activities, potentially disturbing	• Carrying out site grading and bench development using slope stabilization techniques such as gabions, toe walls, and proper compaction. • Installation of temporary silt fences, sediment traps, and stormwater diversion channels to prevent erosion and sediment discharge into surrounding land. • Designing stormwater drainage	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during the layout and design phase

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		personnel movement. • Planning stormwater drainage, sumps, and trenches to prevent flooding during monsoon. • Designing cable trenches and earthing grid layout to ensure operational safety and prevent electrical hazards. • Strategic placement of firewalls and fire extinguishing systems, including access for firefighting vehicles. • Designating and integrating green spaces and buffer zones to improve visual impact and promote ecological balance. • Installation of perimeter fencing or compound wall for asset protection and safety.		nearby communities or wildlife. • Soil compaction reducing infiltration capacity and hindering future landscaping potential. • Risk of stagnant water formation due to inadequate grading, promoting mosquito breeding. • Safety concerns due to the use of excavation equipment, deep pits, and height work during fencing and layout implementation. • Construction workers may place pressure on local resources and services. • Felling of 98 nos. of Siris trees and 40937 nos. of tea bushes resulting in removal of vegetation and potential bird/insect habitat loss. • Disruption of microhabitats and nesting sites, reducing	aligned with the natural flow direction and ensure regular maintenance to prevent clogging. • Maintain construction machinery to reduce noise emissions; restrict operation hours (6 am to to 6 pm) minimize community disturbance. • Spray water on unpaved roads and exposed surfaces during dry periods (December to April) to reduce airborne dust. • Regular sprinkling of water to minimize dust. • Installation of green netting/dust barriers around the construction site and along the plantation boundaries. • Stockpiling of excavated topsoil			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		• Felling of tea bushes and trees due to construction needs.		local ecological diversity. • Possible erosion due to disturbance of natural contours. • Risk of minor encroachment on adjoining land if boundary is not well established.	separately for reuse in green belt development and erosion control. • Provide clear signage and fencing at excavation sites and ensure workers are trained in safety protocols and equipped with PPEs. • Worker accommodation and facilities will be provided within substation construction sites. • Felling limited to essential trees; prior approval to be obtained from Forest Department, if required. • Plantation of native, nectar and fruit bearing species to restore habitat value at post-construction stage.			
4.	Sizing of Equipment,	• Choosing transformers, breakers, isolators,	Substation land	• Land Disturbance & Excavation Impacts – Large equipment may	• Avoidance of unnecessary excavation to reduce	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	Type and Capacity	etc., based on voltage, current, and system configuration. • Designing equipment placement and spacing with proper electrical clearances and ease of operation. • Grounding and Earthing Design – Designing the earthing system to safely dissipate fault currents and ensure personnel safety. • Provision for Expansion – Reserving space and planning layout to accommodate future capacity additions.		require deep or extensive foundations, potentially altering soil stability and topography. • Increased Oil Storage Risk – Sizing of oil-filled transformers may lead to increased risk of spillage, fire hazard, and contamination if containment is not adequate.	soil erosion, and prevent sediment runoff into nearby areas. • Inclusion of impervious oil containment pits with adequate storage capacity to capture the full volume of oil. These pits will be lined with oil-resistant, non-permeable materials and equipped with oil-water separators to manage potential transformer oil leakage or spillage. • Optimization of Equipment Placement to ensure minimum land use with compact and safe placement while adhering to electrical clearances.			
Facilities Set-up								
5.	Temporary Worker Camps	• Establishment of temporary shelters and kitchens for workers.	Worker Camp	• Soil and water contamination due to uncontrolled waste disposal.	• Labour camps to be sited with the premise of Subproject site and	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring, at least bi-weekly, during the

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		• Use of water for drinking, cooking, bathing, and washing. • Generation of domestic wastewater and sewage. • Disposal of kitchen waste and solid non-biodegradable waste (plastic, packaging, etc.). • Storage and disposal of construction-related waste within or near the camp. • Burning of waste or biomass for cooking. • Collection and use of firewood or timber from nearby areas. • Hunting, poaching, or fishing by workers for personal consumption. • Noise, dust, and light pollution from camp operations. • Interaction with local communities. • Construction of temporary sanitation		• Groundwater depletion or pollution from untreated sewage. • Loss of local flora and fauna due to poaching and wood harvesting. • Risk of human-wildlife conflict. • Vector-borne diseases (e.g., malaria, dengue) from poor drainage or stagnant water. • Air pollution from burning of waste and biomass. • Health risks for workers due to unhygienic conditions and lack of medical access. • Social tensions with host communities due to cultural insensitivity, competition over local resources, or misconduct. • Visual and noise disturbance to nearby residents and wildlife. • Increased fire risk due to unsafe cooking or electrical practices.	approved by PIU/PMC as per the IFC performance standards **(Appendix 13).** • Provision of adequate sanitation facilities (1 toilet per 10 workers) with wastewater treatment systems (e.g., bio-toilets or soak pits), and installation of fire-fighting equipment (such as fire extinguishers and sand buckets) at strategic locations within worker camps to ensure hygiene and fire safety compliance. • Establishment of a waste management system including segregation, collection, and safe disposal. • Prohibition of hunting, poaching, and collection of			construction period.

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		facilities (pit latrines, soak pits, etc.).			firewood through clear code of conduct. • Provision of clean energy sources (e.g., LPG) for cooking. • Ensure clean drinking water supply. • Monthly health check-ups and access to first-aid facilities in the camp. • Monthly training of workers on hygiene, sanitation, and respectful behavior towards local communities. • construction workers will adhere to a strict Code of Conduct, including zero tolerance for gender-based violence (GBV). • GRM will include a clear procedure for receiving and addressing grievances from laborers, with a dedicated grievance register for laborers.			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					• Use of proper drainage systems to avoid waterlogging and breeding of mosquitoes. • Regular cleaning and disinfection of the camp area. • Installation of signage and safety warnings in local languages and ensure emergency contact numbers are displayed. • Ensure camp lighting is downward-directed and not excessive to reduce impact on fauna			
6.	Procurement of construction materials from Borrow areas and quarries. Transportation and unloading of material at	• Identification and operation of borrow areas and quarries (in coordination with regulatory authorities). • Extraction and transportation of sand, aggregates, stones, and earth materials to site.	• Borrow areas and quarry sites. • Construction site, Stores, machine shops	• Land degradation due to excavation in borrow areas and establishment of storage/workshop facilities. • Additional Tree cutting and vegetation clearance resulting in loss of habitat for local flora and fauna. • Soil and water contamination from	• Preparation and implementation of a Borrow Area and Quarry Management Plan as per regulatory guidelines. • Use of approved/authorized borrow areas and licensed quarries. • Avoidance of sourcing material	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous monitoring during procurement and transportation of construction materials

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	site, storage and workshop	• Site preparation for material storage, workshop and maintenance areas, including additional vegetation clearance and tree cutting. • Construction of temporary sheds for storage of construction materials, oils, fuels, lubricants, paints, chemicals, etc. • Setup of on-site workshop for activities like steel cutting, welding, fabrication. • Unloading of heavy equipment and materials using cranes and trailers. • Fuel storage and refuelling areas established near workshop zones. • Temporary access road creation or use of village roads for material transportation.		improper storage of oils, chemicals, paints, lubricants, and workshop wastewater. • Increase in dust, noise, and vibration levels due to material transport and unloading activities. • Risk of accidents or disruption to community due to increased traffic and use of narrow roads. • Generation of solid and hazardous waste (e.g., scrap metal, used oil filters, containers, etc.). • Fire hazard due to improper storage of flammable materials and welding activities. • Erosion and runoff risks from disturbed lands and absence of proper drainage. • Nuisance and safety risks to local communities due to poor site management. • Lose of crop for the temporary access road	from ecologically sensitive zones, forests, or near water bodies. • Storage of construction materials, chemicals, and fuels in paved, bunded areas with roofing and proper labelling. • Construction of soak pits or oil/grease traps to manage workshop and storage yard effluents. • Installation of firefighting equipment and sand buckets at workshops, stores, and refuelling stations. • Organising fire safety training for workers and assign emergency response personnel. • Provision of PPEs to workers engaged in cutting, welding, and			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
				creation for material transportation.	handling chemicals/fuels. • Ensuring proper signage, lighting, and safety barriers around storage and unloading areas. • Preparation and implementation of a Traffic Management Plan, mapping sensitive locations and providing alternate routes and speed restrictions. • Ensuring all transport vehicles meet pollution control norms and have valid fitness certificates. • Strict prohibition of additional vegetation clearance. • Regular collection and disposal of solid and hazardous waste through authorized vendors and preparation and • Design storage zones with stormwater runoff management			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					and spill containment features. • Prior consents and Compensation will be provided as per the entitlement matrix of the ESMPF documents for any lose of crop & zirat.			
During Construction Phase								
7.	Excavation, RCC, Foundations, Control Room, Pathways, Earthing & Switchyard Structures	• Excavation of pits for foundations of equipment, transformers, gantry and switchyard structures, and the control room building using excavators and manual methods. • Bending, placing, and fixing of steel reinforcements at foundation sites followed by pouring reinforced cement concrete (RCC) for structural stability of foundations, control rooms, and trenches. • Construction of the control room building, cable	Substation land	• Risk of soil, surface water, and groundwater contamination due to accidental fuel or oil leaks from machinery and improper chemical storage or disposal. • Excavation and stockpiling of soil may lead to sediment-laden runoff during rains, impacting drainage systems, aquatic habitats, and soil stability, especially on sloped terrain. • Generation of construction debris (concrete, metal, packaging waste), and risks associated with improper disposal	• Stabilization of excavated areas through compacting and backfilling. Avoid excavation during heavy rains and cover exposed soil with tarpaulins or vegetation. Use silt fences, sediment traps, and bunds to prevent runoff and erosion. • Proper drainage to avoid waterlogging. Designated areas for equipment washing with wastewater collection. Segregate construction waste and dispose of it in designated,	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring during construction

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		trenches, cable trays, drainage systems, internal roads, pathways, and foundation pillars. • Installation and earthing of switchyard structures, transformers, and associated electrical equipment following safety standards. • Use of diesel-powered equipment like excavators, concrete mixers, vibrators, and transport trucks during construction. • Temporary stacking of excavated soil near construction areas and re-use or disposal. • Installation of cable trays and ducts in prepared trenches across the substation site. • Transportation of construction		affecting land and water quality. • Unmanaged disposal of excess soil or muck may block natural drains or alter the natural slope, leading to localized flooding or soil degradation. • Generation of dust during excavation, concreting, and transportation, along with emissions from diesel engines. Noise from mixers, vibrators, and machinery can disturb nearby communities and wildlife. • Increased dust and noise levels may cause respiratory issues and general discomfort to nearby residents, especially vulnerable groups like children or the elderly. • Workers face risks such as manual handling injuries, falls, dust inhalation, exposure to	approved landfills or recycling facilities. Store and reuse topsoil for landscaping. • Regular maintenance of machinery to prevent leaks and emissions. Use of low-emission. equipment where possible. Sprinkle water on exposed soil to suppress dust, cover stockpiles, and conduct air and noise quality monitoring in sensitive areas. • Development and implementation of an OHS Management Plan. Ensure the availability and use of PPEs (helmets, gloves, safety shoes, masks, ear protection). Conduct regular training on health, safety, emergency response, and electrical safety.			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		materials and heavy machinery across often unpaved or sloped terrain.		hazardous substances, electrical hazards, and fire risks during welding, cutting, or equipment testing. • Construction activities may increase traffic congestion on local roads, pose risks of road accidents, and obstruct public access routes. • Potential for conflicts between migrant laborers and host communities, including risks of gender-based violence (GBV), sexual exploitation and abuse (SEA), and cultural misunderstandings. • Possibility of wildlife encounters and accidental discovery of archaeological or culturally significant artifacts.	Provide first-aid kits, fire extinguishers. • Erection of fencing and warning signage around hazardous zones. Restriction of public access to the site. Appointment of a community consultation officer and maintenance of a grievance redressal mechanism. Scheduling high-noise or high-traffic activities during times that minimize community disturbance (6 am to 6 pm) • Preparation and enforcement of a Traffic Management Plan in consultation with local authorities. Deployment of flagmen and signage around construction zones. Schedule material transport during non-peak hours and maintain			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					alternate pedestrian routes and emergency access. • Storage of fuel and chemicals in secure, bunded areas on impermeable surfaces. Training of workers in spill response and ensure spill kits are available. Prohibit refuelling on bare soil and conduct regular inspections. • Orientation of migrant laborers on local norms and behavioral expectations. Implementation of a Code of Conduct for workers. Establishment of a labour grievance redressal committee and enforcement of Gender Action Plan to address GBV/SEA risks. Conduct monthly health check-ups and awareness sessions.			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					• In case of wildlife sightings, halt work and contact the Forest Department for rescue. • If any archaeological artifacts or culturally significant materials are discovered during construction activities, immediately suspend work in the affected area and promptly notify the district administration and relevant heritage authorities for further guidance and protection measures.			
Erection								
8.	• Transportation of Power Transformer • Unloading and Erection of Power Transformer • Erection of Substation Bus Bars and Bus Couplers	• Moving the heavy power transformer to the substation site using flatbed trailers over existing roads and bridges. • Safely unloading the transformer upon arrival and erecting it on the designated transformer bay with	• Access routes to the substation site • Substation site including transformer bays, battery	• Injuries or fatalities due to lack of PPE, untrained personnel, unsafe erection procedures. • Soil and water contamination from spills of transformer oil, fuels, chemicals, battery water. Air pollution and greenhouse gas	• Plan transportation during low traffic hours to minimize community disruption. • Mandatory use of full Personal Protective Equipment (PPE) for all site workers at all times, including helmets, gloves,	EPC Contractor	PMC, PIU & PMU (AEGCL)	Regular monitoring

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	• Installation of Transformer Bays, Line Bays, and Terminal Gantries • Transformer Oil Filling • Storage and Handling of Battery Water, Battery Banks, and Chemicals • Internal Wiring and Connectivity in Control Room Panels • Storage and Management of SF6 Gas Cylinders	appropriate lifting equipment. • Installing and connecting bus bars, bus couplers, and related bus items to establish electrical pathways. • Setting up the transformer bays and line bays, as well as erecting incoming and outgoing line terminal gantries. • Filling transformers with insulating oil as part of their commissioning and operational readiness. • Proper storage and management of battery water, battery banks, and other chemical substances required at the site. • Establishing electrical connections and wiring inside the control room panels	room, switchyard, control room, and storage areas	emissions from SF6 leaks. Fire hazards from short circuits or overloaded electrical connections. • Potential for conflicts between migrant laborers and host communities, including risks of gender-based violence (GBV), sexual exploitation and abuse (SEA), and cultural misunderstandings	safety boots, eye protection, and high-visibility clothing. • Conduct safety inductions and regular training sessions emphasizing safe lifting, rigging, and electrical work procedures. • Ensure qualified and experienced personnel operate cranes, rigging, and electrical installations. • Construct concrete, covered and bunded pads for storage of transformer oils, fuels, battery water, and chemicals to prevent soil contamination and runoff. • Store fuel and hazardous materials away from worker camps and public areas, clearly marked with hazard signs and			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
		for different bays and equipment. • Safe storage, handling, and monitoring of SF6 gas cylinders used in circuit breakers and switchgear.			fire protection measures. • Regularly inspect and maintain firefighting equipment onsite, including extinguishers, fire blankets, and alarms. • Implement electrical protection systems (e.g., circuit breakers, relays) and conduct routine testing. • Store SF6 gas cylinders in a well-ventilated, secure area with restricted access. • Regularly inspect gas handling equipment for leaks using detection instruments. • Train personnel on SF6 handling protocols and emergency response in case of leakage. • Maintain detailed logs of SF6 inventory, usage, and leak			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					incidents to track and minimize emissions. • Orientation of migrant laborers on local norms and behavioral expectations. Implementation of a Code of Conduct for workers. Establishment of a labour grievance redressal committee and enforcement of Gender Action Plan to address GBV/SEA risks. Conduct monthly health check-ups and awareness sessions • Coordinate closely with local authorities and environmental agencies for compliance and emergency support.			
Post-Construction and Commissioning Phase								
9.	• Charging of power transformer and providing	• Erection, oil filling, and commissioning of the power transformer	• Switchyard area for transforme r erection and	• Oil leakage from transformers may contaminate soil and groundwater.	• Construction of concrete-lined containment pits around transformer foundations to	EPC Contractor, PIU AEGCL	PMC & PMU (AEGCL)	Continuous monitoring during the commissioning phase,

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	auxiliary power supply • Installation of communication systems and power line carrier communication • Connection and termination of incoming transmission lines into substation equipment	• Installation of connectivity and internal wiring in control room panels • Connecting jumpers and spacers between incomer lines and substation bus bars, transformers, isolators, current transformers, potential transformers, and circuit breakers • Installation of accessories on power cables • Restoration of disturbed soil, slope stabilization, development of green belt • Testing and commissioning of all substation systems	charging activities • Control room and switchyard for communication and wiring tasks • Entire substation premises for line connection, restoration work, and green belt development	• Improper slope management and blocked drains can lead to soil erosion and increased surface runoff. • Leftover construction materials and debris can pollute the surroundings and hinder vegetation growth. • Risk of fire, explosion, or electric shock from improper transformer installation or oil leaks. • Injuries or accidents during installation of communication equipment and electrical components due to poor safety practices. • Potential risks include electrical hazards, such as accidental contact with high-voltage equipment, and noise from transformers and other operational equipment to the near-by community.	collect leaked oil and prevent soil and water pollution. • Implementation of slope stabilization techniques, clearing all blockages in drainage paths, and restoration of topsoil after construction. Development of green belts with native vegetation to improve soil binding and ecological balance. • Ensure post-construction site cleaning, safe disposal of waste, and implementation of a landscaping plan for vegetation recovery. • Maintaining functional fire-fighting systems at site, conduct regular safety inspections, and ensure only trained personnel			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
					handle high-risk activities. • Enforce strict safety protocols such as use of personal protective equipment, work permits, lockout/tagout systems, and clearly marked danger zones. • To ensure community safety during operations, the substation will implement strict access controls, secure fencing, and surveillance to prevent unauthorized entry. Warning signs about electrical hazards will be clearly displayed. Regular equipment maintenance will minimize noise and prevent faults. Emergency response plans will be coordinated with			

Sl. No.	Project Activity	Tasks	Location	Potential Impacts	Mitigation Measures	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
					local authorities, and as and when require community awareness programs will be conducted to educate residents on safety measures and emergency contacts.			

7.2 Environmental and Social Monitoring Plan

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 ESMoP 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.

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.	Inside the substation location and nearby community.	National Ambient Air Quality Standards (NAAQS), CPCB	EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
	B. Construction Stage						Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)						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	EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
	B. Construction Stage						Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)						Once
3. Noise	A. Pre-construction stage	Noise level (dB level) On hourly basis for 24 hours	Nearby habitation areas	As per CBCB and WHO guidelines	EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
	B. Construction Stage						Twice a year (Pre-monsoon and Post monsoon)

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	C. Operation Stage (Commissioning Stage)						Once
4. Soil	A. Pre-construction stage	PH, Moisture, Conductivity, Oxidation Reduction Potential, Nitrogen, Phosphorous, Sulphate, Chloride, Total Organic Carbon, Nitrate, Arsenic, Cadmium, Lead, Iron, Zinc, Copper, Total Coliform.	Substation Location	As per CBCB and IS guidelines	EPC Contractor by CPCB/SPCB approved or NABL Accredited laboratory	PMC, PIU & PMU (AEGCL)	Once
	B. Construction Stage						Twice a year (Pre-monsoon and Post monsoon)
	C. Operation Stage (Commissioning Stage)						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 Traffic Management Plan	Record keeping of vehicles used to identify increased traffic load in localities	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
	B. Construction Stage			Logbook for in-out time of vehicle on site	EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
	C. Operation Stage (Commissioning Stage)			Maintenance of Logbook for in-out time of vehicle on site	PIU (AEGCL)	PMU (AEGCL)	Continuous activity
7. Carcass	A. Pre-Pre-construction stage	Visual inspection for substation location	Substation location	Reporting to concerned forest/wildlife authority for identification of species. Record to be maintained for number of carcasses	EPC Contractor, PIU AEGCL	PMU, AEGCL	Continuous activity
	B. Construction stage	Visual inspection for substation location	Substation location		EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous activity
	C. Operation Stage	Visual inspection for substation location	Substation location		PIU (AEGCL)	PMU (AEGCL)	Continuous activity

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
8. Grievance Mechanism	A. Pre-construction stage	Formation of Grievance Redressal Committee	All Project Locations	Notification of formulation of GRM and GRC and display of GRM procedure in project locations	EPC Contractor, PMC, PIU and PMU	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 Stage (Commissioning Stage)	Working files of GRC and GRM records			EPC Contractor	PMC, PIU & PMU (AEGCL)	Continuous
9. Stakeholder Engagement	Pre-construction stage	Mapping of stakeholders	Substation location	Consultation record with mapped stakeholders (minutes of Consultation and attendance sheet)	PIU (AEGCL)/PMU/ PMC	AEGCL-PMU/ AEGCL Field officials & PMC	Continuous activity
	B. Construction stage	Listing of identified stakeholders	Substation location	Consultation record with mapped stakeholders (minutes of Consultation and attendance sheet)	Contractor/PMC/AEGCL	AEGCL-PMU/AEGCL Field officials & PMC	Continuous activity
	C. Operation Stage	Identified stakeholders at project pre construction and construction stage	Substation location	Consultation record with mapped stakeholders (minutes of Consultation and attendance sheet)	AEGCL Field Officers	AEGCL- PMU/ AEGCL Field officials & PMC	Continuous activity
10. Compensation	A. Pre-construction stage	Identification of project-affected people and disbursement of compensation.	Substation location	Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013.	PIU & PMU (AEGCL)	PIU & PMU (AEGCL)	During detailed identification of land parcel
	B. Construction Stage	Working files of GRC and GRM records	Substation location		EPC Contractor, PMC & PIU (AEGCL)	PMC, PIU & PMU (AEGCL)	Continuous activity

Environmental & Social Component	Project stage	Parameters to be monitored	Location	Standards	Implementing Responsibility	Monitoring Responsibility	Monitoring Frequency
	C. Operation Stage (Commissioning Stage)	Working files of GRC and GRM records	Substation location		PIU (AEGCL)	PIU & PMU (AEGCL)	Continuous activity
11. Livelihood	A. Pre-construction stage	Identification of any impact on livelihood due to acquisition of land, crop damage and zirat damage and disbursement of compensation.	Substation	As specified in the Rightto Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013.	Revenue Department & AEGCLconcerned divisional officer.	PIU & PMU (AEGCL)	During detailed identification of land parcel
	Construction stage	Working files of GRC and GRM records			EPC Contractor, PMC & PIU (AEGCL)	PMC, PIU & PMU (AEGCL)	Continuous activity
	C.Operation Stage	Working files of GRC and GRM records			PIU (AEGCL)	PIU & PMU (AEGCL)	Continuous activity

7.3 Budget for ESMP Implementation

The implementation of the Environmental and Social Management Plan (ESMP) for the proposed 132/33 kV (2X50 MVA) GIS at Titatbor and 132/33 kV (2X50 MVA) AIS at Chabua has been strategically designed with a focus on cost-effectiveness and sustainability. The financial planning under the ESMP is based on a "least-cost" approach, ensuring that mitigation measures are applied efficiently without compromising environmental and social integrity. The adherence to this plan involves incurring essential expenditures that are crucial for minimizing potential environmental and social risks. Failure to allocate these resources could lead to significant negative impacts, including the degradation of the local biophysical environment and adverse consequences for the surrounding communities. The cost estimates have been developed following a thorough assessment of potential impacts across all project phases—pre-construction, construction, and operation and incorporate essential components such as environmental monitoring, capacity building, awareness programs, and training. The detailed cost breakdown presented in **Table 23**. This ensures that the financial resources are not only adequate but also targeted toward the most critical environmental and social safeguards, thereby supporting the project's overall sustainability and compliance with regulatory and community expectations.

Table 23 : ESMP Implementation Budget for 132/33 kV (2X50 MVA) GIS at Titatbor and 132/33 kV (2X50 MVA) AIS at Chabua

Sl. No.	Description	Quantity	Unit	Rate (in INR)	Amount (in INR)
A.	***Environmental Monitoring (Pre-construction Stage)***				
1	Air Quality	2	No.	21,440	42,880
2	Water Quality (Surface and Ground water both)	2	No.	25,360	50,720
3	Noise Levels	2	No.	7,000	14,000
4	Soil Quality	2	No.	12,300	24,600
Sub-Total Cost					**1,32,200**
B.	***Environmental Monitoring (Construction Stage)***				
1	Air Quality (Twice a year for 3 year)	12	No.	21,440	2,57,280
2	Water Quality (Twice a year for 3 year)	12	No.	25,360	3,04,320
3	Noise Levels (Twice a year for 3 year)	12	No.	7,000	84,000
4	Soil Quality (Twice a year for 3 year)	12	No.	12,300	1,47,600
Sub-Total Cost					**7,93,200**
C.	***Environmental Monitoring (Operation Stage)***				
1	Air Quality	2	No.	21,440	42,880
2	Water Quality (Surface and Ground water both)	2	No.	25,360	50,720
3	Noise Levels	2	No.	7,000	14,000
4	Soil Quality	2	No.	12,300	24,600
Sub-Total Cost					**1,32,200**
D.	***Capacity building (Training/ Workshops) and Health Awareness Camp***				
1	Training on Implementation of ESMP for PIU (Once per year for 3 years) EPC contractors: (Twice per year for 3 years)	18	No.	2,00,000	36,00,000
2	Health & Safety Awareness Camp:		No.	50,000	8,00,000

Sl. No.	Description	Quantity	Unit	Rate (in INR)	Amount (in INR)
	Pre-Construction- Once, Construction- 2 times / year for 3 years, Operation- Once	16			
3	Training on Implementation of GRM and Gender Action Plan for PIU and EPC (Bi-annually for 3 years)	12	No.	20,000	2,40,000
4	Training on Occupation Health and Safety for PIU and EPC (Quarterly for 3 years)	24	No.	20,000	4,80,000
					51,20,000
E.	***BOQ items***				
1	SF_6 retrieving arrangement as per site requirement.	2	LOT	5,00,000	10,00,000
2	Personal protective equipment's (Hard hats (with full/partial brims as necessary) Safety glasses with side shields. Face masks/shields. Suitable footwear (safety/steel-toed boots, rated dielectric footwear) Insulating gloves (rated, used along with leather/cloth linings for shock protection)), Plantation (Landscaping) as per site requirement.	2	LOT	5,40,672	10,81,344
Sub-Total Cost					**20,81,344**
Total Cost (A+B+C+D+E)					***82,58,944***
Contingency					***2,82,650***
Grand Total					***85,41,594***

Chapter 8: Climate Risk and Vulnerability Assessment

8.1 Introduction

This climate risk and vulnerability assessment has been prepared for the both subprojects i.e., the newly proposed 132/33 kV (2X50 MVA) GIS at Titabor, Jorhat District and 132/33 kV (2X50 MVA) AIS at Chabua, Dibrugarh District of Assam (Package B, Phase II) in accordance with the Asian Infrastructure Investment Bank's (AIIB) *Methodology for Assessing the Alignment of AIIB Investment Operations with the Paris Agreement* (2023)[11]. The purpose of Climate Risk and Vulnerability Assessment (CRVA) is to examine climate and other hazards that pose risks to subproject activities, assets, and beneficiaries; assess the sensitivity of subproject components to climate conditions; and identify adaptation options that can be integrated into project design, assuming they are technical feasible and economically viable.

8.2 Methodology

The Climate Risk and Vulnerability Assessment (CRVA) methodology primarily relied on desk reviews of existing literature on climate change projections for the region, vulnerability assessments of the power transmission sector, and relevant adaptation studies. It also incorporated project-specific design documents to ensure a comprehensive evaluation. The assessment leveraged climate data from the World Bank's Climate Change Knowledge Portal (CCKP)[12,13], which provides modelled projections based on various emission scenarios and Shared Socioeconomic Pathways (SSPs)[14]. These projections are derived from the Coupled Model Intercomparison Projects (CMIP), a global climate modeling initiative under the World Climate Research Program. Specifically, CMIP6 supports the findings of the IPCC's Sixth Assessment Report[15]. Additionally, an overview of natural hazards and risks at the subproject locations were obtained using Think Hazard[16], a web-based rapid screening tool. This tool enables non-specialists to assess potential disaster impacts by providing a general hazard assessment for a given location. It categorizes hazard levels as low, moderate, or high, helping to evaluate climate-related risks and inform adaptation strategies to enhance the resilience of power transmission infrastructure. However, the hazard levels as shown do not replace the need for detailed natural hazard risk analysis and/or expert views and advice that could be considered in project design and implementation to promote disaster and climate resilience.

8.3 Limitations

Despite widespread recognition of climate change impacts, addressing them through climate proofing remains a complex challenge. The intricate ways in which climate change manifests, along with uncertainties in defining climate risks and vulnerabilities, make it difficult to implement effective measures. Additionally, gaps in essential information resources further hinder efforts to integrate

[11] https://www.aiib.org/en/about-aiib/who-we-are/partnership/_download/Methodology-for-Assessing-the-Alignment-of-AIIB-Investment-Operations-with-the-Paris-Agreemement.pdf
[12] https://climateknowledgeportal.worldbank.org/country/india/climate-data-historical
[13] https://climateknowledgeportal.worldbank.org/country/india/climate-data-projections
[14] https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_TS.pdf
[15] https://www.ipcc.ch/assessment-report/ar6/
[16] https://thinkhazard.org/en/report/17578-india-assam-darrang

climate resilience into regional investment projects. There is no clear and universally adopted methodology to model the adverse effects of climate change and its integration in infrastructure design procedures.

As the climate change adaptation and mitigation measures for both the subprojects are based primarily on desk reviews of the project design documents, there will certainly be a large number of important qualification and limitation issues affected by deficient assessments of climate risks and vulnerabilities that impact the interpretation and application of mitigation and adaptation measures in terms of appropriateness and robustness of climate proofing.

8.4 Climate variability, Future Climate Projections and Natural Hazards in Assam

Assam is prone to natural hazards such as cyclonic storms, floods, landslides, river erosions, earthquakes etc. as listed in the Assam State Disaster Management Plan (2022, Vol. I). Heavy torrential rainfall is common in Assam, which often results in flooding along the Brahmaputra River. The exposure to such hazards is sometimes aggravated by earthquakes as Assam is in one of the most seismically active regions in the World. Climate change could impact all the outputs and activities under the subproject, including the sub-station infrastructure, associated transmission line infrastructure and other facilities. This section reviews historical information on and projections of climate variability and change, as well as the incidence of geophysical and other events in the state of Assam, Titabor, Jorhat District (26°36'58.79"N 94°15'02.20"E) where the newly proposed 132/33 kV (2X50 MVA) GIS substation and Chabua, Dibrugarh District (27°27'55.34"N 95°11'27.57"E) where the newly proposed 132/33 kV (2X50 MVA) AIS substation (Package B) under Phase II of AISTSEP will be located.

The IPCC Sixth Assessment Report introduces Shared Socioeconomic Pathways (SSPs) to assess future climate scenarios based on emissions, mitigation efforts, and socioeconomic factors such as population growth, urbanization, education, land use, and economic development. The projections for Assam are based on the SSP2-4.5 scenario, which represents a “middle of the road” scenario in which CO_2 emissions hover around current levels before gradually declining in the mid-21st century but do not reach net-zero by 2100. Under this scenario, global temperatures are projected to increase within a very likely range of 2.1°C to 3.5°C by the end of the century.

Table 24 : Shared Economic Pathways

SSP No.	Scenario (Likelihood)	Estimated Warming, °C		Very Likely Range, °C
		(2041–2060)	(2081–2100)	(2081–2100)
SSP1-1.9	Very low GHG emissions: CO_2 emissions cut to net zero around 2050	1.6	1.4	1.0 – 1.8
SSP1-2.6	Low GHG emissions: CO_2 emissions cut to net zero around 2075	1.7	1.8	1.3 – 2.4
SSP2-4.5	Intermediate GHG emissions (likely): CO_2 emissions around current levels until 2050, then falling but not reaching net zero by 2100	2.0	2.7	2.1 – 3.5
SSP3-7.0	High GHG emissions (unlikely): CO_2 emissions double by 2100	2.1	3.6	2.8 – 4.6
SSP5-8.5	Very high GHG emissions (highly unlikely): CO_2 emissions triple by 2075	2.4	4.4	3.3 – 5.7

°C = degree Celsius, CO_2 = carbon dioxide, GHG = greenhouse gas, SSP = Shared Socioeconomic Pathway
Source: World Bank Climate Change Knowledge Portal

8.4.1 Rise in Temperature

Assam has a temperate, tropical monsoon rainforest climate with the highest temperature of 35°C – 39°C in summer and the lowest temperature of 5°C–8°C in winter. Temperatures are moderate in spring (March–April) and autumn (September–October). Long-term temperature trends in Assam, projected using the World Bank's Climate Change Knowledge Portal (CCKP), are likely to be continuous increase, although at a slower rate. The SSP2-4.5 projections of temperature and rainfall extracted here for the state of Assam for a few selected temperature indicators of interest are as follows: (i) maximum of daily max temperature and (ii) days with heat index >35°C **(Table 25)**. The projections show that the state will experience high extreme temperatures above 35°C. Furthermore, the annual number of extreme hot days will increase from 18 days to 50 days on average in successive decades as a result of climate change.

Table 25: Projections of Selected Temperature Indicators (Reference Period 1995–2014)

Scenarios	2020–2039	2040–2059	2060–2079	2080–2099
	(a) Projected Average Single-day Maximum of Daily Maximum Temperatures, °C 50th percentile, median (10th to 90th percentile range)			
SSP2-4.5	37.66 (34.52 – 40.65)	38.4 (35.13 – 41.74)	39.19 (35.74 – 42.50)	39.87 (36.38 – 42.98)
	(b) Projected Hot Days with Heat Index, Tmax >35°C, days 50th percentile, median (10th to 90th percentile range)			
SSP2-4.5	17.95 (2.10 – 44.22)	26.43 (4.61 – 59.97)	38.67 (7.43 – 71.02)	49.99 (11.90 – 79.69)

Source: World Bank Climate Change Knowledge Portal

8.4.2 Precipitation and Flooding

Assam experiences heavy rainfall and high humidity. Its climate is characterized by heavy monsoon downpours, which reduce summer temperatures, and enable formation of foggy nights and mornings in winter. Over 70% of the precipitation occurs during June–September. Rainfall is moderate in spring (March–April) and autumn (September–October). Assam lies in the middle of the Brahmaputra and Barak basins. Due to their geo-climatic conditions, the Brahmaputra and Barak River basins in Assam are susceptible to flooding. In particular, the Brahmaputra Valley in Assam is one of the most hazard-prone regions of the country, with more than 40% of its land (3.2 million hectares) vulnerable to flooding, accounting for 9.4% of India's total flood-prone area.

Flood hazards in the state are due to a blend of numerous natural and anthropogenic factors. Floods are caused by the runoff of extremely heavy rainfall during monsoons and high sediment loads from upper watersheds that are geologically unstable and degraded because of deforestation and changing land use. Floods combined with river erosion has significant impacts. Moreover, frequent floods occur in the Brahmaputra basin because of the unique physiographic setting characterized by the limited width of the valley and the abruptly flattened gradient, together with the high-water yield, leading to tremendous drainage congestion. **Table 26** shows the average largest 1-day precipitation and the projected days with precipitation >20 mm.

Table 26: Projections of Selected Precipitation Indicators (Reference Period 1995–2014)

Scenarios	2020–2039	2040–2059	2060–2079	2080–2099
	(a) Projected Average Largest 1-day Precipitation, mm 50th percentile, median (10th to 90th percentile range)			
SSP2-4.5	73.89 (31.68 – 145.90)	74.19 (31.71 – 151.45)	79.62 (32.17 – 170.32)	80.99 (31.96 – 167.65)
	(b) Projected Days with Precipitation >20 mm, days 50th percentile., median (10th to 90th percentile range)			
SSP2-4.5	23.89 (4.27 – 63.21)	25.72 (5.27 – 63.34)	25.85 (5.79 – 65.27)	25.6 (6.06 – 61.22)

mm = millimeter, SSP = Shared Socioeconomic Pathway
Source: World Bank Climate Change Knowledge Portal

The above precipitation projections of selected indicators for Assam show a gradual increase in the average largest 1-day precipitation as well as the number of days with precipitation over 20 mm in successive decades as a result of climate change. Besides, an overwhelming number of climate literatures assert that more frequent heavy to extreme precipitation events can be expected with climate change. Such increase in the intensity of heavy rainfall events is expected to result in flooding.

8.4.3 High winds and cyclonic storms

According to the Wind Hazard Map of Assam featured in the Vulnerability Atlas of India (3rd Edition) by BMTPC, Jorhat District and Dibrugarh District fall under the Very High Damage Risk Zone-B for wind hazards. These classifications reflect the regions' vulnerability to moderate to severe wind events, especially during the pre-monsoon and monsoon seasons when convective storms are common. The Basic Wind Speed (Vb) in both areas ranges from 7 m/s to 55 m/s, underscoring the importance of incorporating wind-resistant features in structural design. The projected change in days without noticeable wind (i.e., days when the mean wind speed is below 1 m/s) can be used as an indicator for future cyclone and wind hazard estimation. under the SSP2-4.5 scenario, cyclonic risks and impacts in Titabor, Jorhat District and Chabua, Dibrugarh District of Assam are considered high.

8.4.4 Earthquakes

Earthquakes are one of the most destructive natural hazards in the seismically active Assam. According to data of the Global Seismic Hazard Assessment Programme, Assam lies in a region with high to very high seismic hazard risk. It has experienced several devastating earthquakes in the past, resulting in a large number of deaths and severe property damages.

Active seismicity in the region has caused extensive landslides, rock falls on the hill slopes, ground subsidence and earth fissures in the valley, and changes in the course and configuration of river tributaries and the Brahmaputra mainstream. These changes, especially in the river morphology, have a significant impact on the hydrologic regime. Assam falls in the severe seismic Zone V of the Bureau of Indian Standards. Except for a few southern districts, most districts in Assam lie in the Brahmaputra River Valley, whose northern and eastern parts are bounded by the Himalayan Frontal Thrust. The Himalayas rose because of continent–continent collision between the Indian and the Eurasian plates. The arc of the Lohit and Naga Thrusts also lies in the eastern part of Assam, which poses an additional seismic threat. The earthquakes of Magnitude 6 and above measured during instrumental period in Assam are presented in **Table 27**.

Table 27: Earthquake Hazard History of Assam State (M>6.0)

Date	Epicenter	Latitude	Longitude	Origin Time	Magnitude
10th January 1869	9.4 Km North of Kumbhir (Assam)	25.00 N	93.00E	11:45 UTC	7.5
21st January 1941	Near Tezpur, Assam	26.50 N	92.50E	02:30:16.0 UTC	6.5
23rd October 1943	13.6 kms East of Hojai (Assam)	26.00 N	93.00E	17:23:17 UTC	7.2
31st December 1984	SSE of Silchar (Assam)	24.64 N	92.89E	23:33:37 UTC	6.0

Source: Assam State Disaster Management Plan, 20022 (Volume 1)

Table 28: Some of the recent earthquakes

Date	Epicenter	Latitude	Longitude	Origin Time	Magnitude
9th December 2004	Silchar Region, Assam	24.710 N	92.523E	08:49:00 UTC	M 5.4
19th August 2009	Assam Region	26.556 N	92.470E	10:45:13 UTC	M 5.0
30th December 2011	Central Assam region			15:14:00 UTC	M 3.6
25th September 2018	Barpeta			03.47 UTC	M 4.3
27th April 2019	Tejpur			06.27 UTC	M 4.8
13th November 2019	Diphu			13.10 UTC	M 4.7
8th February 2020	Abhayapuri			12.47 UTC	M 5.0
3rd October 2020	Hajo			15.36 UTC	M 4.2
10th December 2020	Goalpara			16.56 UTC	M 4.3
17th February 2021	Dhekiajuli			12.24 UTC	M 4.7
28th April 2021	Tejpur			02.21UTC	M 6.4

8.4.5 Landslides

Landslides are a sudden, short-lived geomorphic event that involves a rapid-to-slow descent of soil or rock in sloping terrains when the stability of the slope changes from 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, including excessive precipitation or human activities, such as deforestation or development. Assam is located on the Himalayas which was recently founded in the mountain history, and is therefore seismically very active and geologically unstable.

Nevertheless, due to low slope gradients, landslide hazard risk in both the proposed sites i.e., Titabor, Jorhat District and Chabua, Dibrugarh District appears to be low. Reduced rainfall, higher temperatures, and higher evaporation are likely to lead to drier catchment conditions which are not conducive to landslips (landslides are normally triggered by slope wetness).

8.4.6 Lightning Strikes

Lightning is one of the most capricious and unpredictable characteristics of a thunderstorm, no one can guarantee an individual or group absolute protection from it. Assam has been experiencing a significant number of lightning strikes in recent times, leading to concerns about public safety and infrastructure damage. Given the unpredictable nature of lightning and its severe consequences, it is

crucial for adherence to safety guidelines during storms, and support ongoing efforts to enhance resilience against such natural disasters.

8.5 Impacts of Climate Hazards and Adaptation Options

Following are the climatic hazards along with remedial measures adapted for substation at design stage under **Phase II** of **AIIB** funded **AISTSEP**.

8.5.1 Temperature Rise

Impact: A rise in temperature can significantly impact power substations by reducing equipment efficiency, increasing the risk of failures, and shortening the lifespan of critical components. High temperatures can cause overheating in transformers, circuit breakers, and other electrical equipment, leading to insulation degradation, increased resistance, and potential breakdowns. Overheated transformers may experience oil degradation, reducing their cooling capacity and increasing the likelihood of faults. Additionally, excessive heat can cause metal expansion, leading to lose connections and increased electrical losses.

Adaptation: To mitigate the impact of rising temperatures several cooling systems, such as forced air ventilation are adopted to help regulate transformer and switchgear temperatures in GIS substations. High-temperature-resistant materials, such as advanced insulation and heat-resistant conductors, improve durability. Smart grid technology, including real-time temperature monitoring and predictive maintenance, allows for proactive adjustments to prevent overheating. Enhanced grounding and fire protection systems further safeguard against thermal stress-related failures. These adaptations collectively enhance substation resilience against rising temperatures and climate change challenges for this subproject.

8.5.2 Flood

Impact: Flooding can have severe impacts on power substations, leading to widespread power outages, equipment damage, and safety hazards. When floodwaters inundate a substation, they can short-circuit electrical components, corrode metal parts, and contaminate insulation materials, reducing their effectiveness. Transformers, circuit breakers, and switchgear may fail, requiring costly repairs or replacements. Additionally, prolonged exposure to water can compromise structural integrity and increase the risk of electrical fires or explosions. Flood-induced power disruptions can also affect critical infrastructure such as hospitals, water treatment plants, and communication networks, amplifying the overall impact on communities.

Adaptation: Most of the substation locations under Phase II of AISTSEP including the proposed 132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS at Chabua (Package B) are away from flood prone area. For low lying substation locations, the area/critical equipment (transformers and control panels) levels are raised sustainably to avoid logging of water. Installing water-resistant barriers and drainage systems will reduce the risk of water infiltration. During preparation of contour plan, Finished Ground Level (FGL) is fixed by considering the Highest Flood level (HFL) data of that area.

8.5.3 High winds and cyclonic storms

Impact: High winds and cyclonic storms pose significant risks to power substations, leading to widespread disruptions and damage. Strong winds can topple transmission towers, uproot poles, and bring down power lines, causing short circuits and outages. Flying debris can strike critical equipment like transformers, circuit breakers, and insulators, leading to mechanical failures and fires. Heavy rainfall and storm surges associated with cyclones can flood substations, damaging electrical components and causing prolonged power failures.

Adaptation: GIS (Gas-Insulated Switchgear) substations are used wherever necessary as they are more resilient than AIS (Air-Insulated Switchgear). Structural reinforcements, such as wind-resistant fencing, reinforced concrete walls, and storm-rated roofs, help protect critical equipment from debris and extreme wind forces. Secure anchoring of transformers, breakers, and other components prevents displacement or damage. Additionally, robust grounding and lightning protection systems help mitigating the electrical hazards caused by storm-induced faults. Vegetation management around substations further reduces the risk of falling trees or debris impacting infrastructure.

8.5.4 Earthquakes

Impact: Earthquakes can have severe impacts on power substations, leading to widespread power outages and infrastructure damage. Strong ground shaking can cause structural failure of transformers, circuit breakers, and busbars, while soil liquefaction can destabilize foundations. Seismic forces may also damage insulators, control panels, and transmission lines, disrupting electricity supply to homes, businesses, and critical facilities. Additionally, fires or explosions may occur due to oil leaks from damaged transformers, further escalating the risks.

Adaptation: When selecting the most suitable method for retrofitting and enhancing the lateral load-resisting capacity of structures, it is essential to consider the entire system, including site characteristics, foundations, and both structural and non-structural components, as per IS 1893 (Part 1): 2002. Notably, evaluating geotechnical properties, soil conditions, and foundation types plays a crucial role in determining the most effective retrofitting approach.

While situated in Seismic Zone V, AEGCL incorporates earthquake-resistant design principles in its substations to ensure structural integrity and operational reliability during seismic events. Substations are designed following the seismic zoning criteria outlined in the Bureau of Indian Standards (IS 1893) and site-specific seismic hazard assessments. Key measures include the use of reinforced concrete foundations, base isolation systems where necessary, and flexible connections in equipment to absorb ground motion without damage. Structures such as control buildings, gantries, transformers, and switchgear are engineered with ductile detailing and seismic anchorage to reduce the risk of tipping or displacement. Equipment layout also considers separation gaps to prevent pounding during quakes.

8.5.5 Landslides

Impact: Landslides can have a devastating impact on power substations by causing structural damage, equipment failure, and service disruptions. When a landslide occurs near or within a substation, it can bury electrical equipment, displace transmission towers, and damage foundations, leading to power outages and costly repairs. Soil movement can also compromise underground cables, disrupt

grounding systems, and increase the risk of short circuits or electrical faults. In extreme cases, landslides may make substations completely inoperable, requiring extensive rebuilding efforts.

Adaptation: The proposed substation is located on stable ground, away from known landslide-prone areas. However, proper slope stabilization techniques, such as retaining walls, terracing, and soil nailing, can help to prevent soil movement. Additionally, adequate drainage systems, including surface water diversion channels and subsurface drainage will reduce water accumulation that may trigger landslides. Foundations are also reinforced with deep piling or rock anchors to enhance stability.

8.5.6 Lightning Strikes

Impact: Lightning strikes can have severe impacts on power substations, potentially causing equipment damage, power outages, and safety hazards. When lightning directly strikes a substation or induces high-voltage surges through transmission lines, it can damage transformers, circuit breakers, insulators, and other critical components. These surges may lead to insulation breakdown, short circuits, or even fires, resulting in costly repairs and prolonged downtime. Additionally, repeated lightning strikes can degrade equipment over time, reducing the reliability of the power grid.

Adaptation: To mitigate the impact of lightning strikes in power substations, several design adaptations are implemented to enhance protection and ensure system reliability. Lightning arresters are installed at key points to divert high-voltage surges safely into the ground, preventing damage to sensitive equipment. Grounding systems with low-resistance earthing help dissipate lightning energy efficiently, reducing the risk of insulation failure and electrical faults. Shielding methods, such as overhead ground wires or lightning masts, are strategically placed to intercept strikes before they reach critical infrastructure. Additionally, surge protection devices are integrated into control and communication circuits to prevent transient overvoltages from affecting sensitive electronic systems. Proper insulation coordination and the use of bushings with high dielectric strength further enhance resilience.

8.5.7 Other Hazard: Use of Sulphur Hexafluoride (SF_6)

Gas insulated systems are now a major component of power transmission and distribution networks all over the world. GIS is used above 132kV, having all components interconnected and insulated via compressed SF_6 (i.e., circuit breakers, disconnections, grounding switches, bush bars, potential transformers, power transformers, cable insulation). Due to compactness and steel shielding structures of GIS substation, it offers significant savings in land use, aesthetically acceptable, have relatively low radio and audible noise emissions.

Impact: Sulfur Hexafluoride (SF_6) is considered one of the most potent greenhouse gases, its relative contribution to global warming is currently considered small (only 0.01%) due to its low overall emission levels, despite having a very high Global Warming Potential (GWP) which is around 23,900 times that of carbon dioxide (CO_2); meaning that even a small amount of SF_6 has a significantly larger impact on warming compared to the same amount of CO_2. SF_6 decomposes under electrical stress in GIS substation forming toxic by-products that are a health threat for working personnel in the event of exposure.

Adaptation: SF_6 retrieving arrangement, advanced sealing techniques, real-time gas monitoring, and regular maintenance to detect and repair leaks promptly. Additionally, improved gas recycling and recovery systems help capture and reuse SF_6, preventing unnecessary emissions. Regulations and industry standards also promote responsible handling and disposal, ensuring that SF_6 emissions are minimized throughout the lifecycle of GIS equipment.

8.6 Climate Risk Screening and Assessment

An assessment of natural hazards and risks at both the subproject locations were conducted using **Think Hazard**, a web-based rapid screening tool. Designed for non-specialists, this tool provides a general hazard evaluation for a specific location, categorizing risk levels as low, moderate, or high. The tool applies an Exposure-Impact-Adaptive capacity framework to characterize risks. By identifying potential disaster impacts, it supports the assessment of climate-related risks and informs adaptation strategies to strengthen the resilience of power transmission infrastructure.

According to the Think Hazard web-based tool, the subproject sites at Titabor and Chabua are exposed to multiple climate and geophysical risks. The river flood hazard is classified as high, with potentially life-threatening floods anticipated at least once every decade. Extreme heat hazard is also high, with severe heat stress events expected at least once within the next five years. Additionally, the project location has experienced geophysical hazards in the past and is expected to experience these in the future with high intensity, frequency, or duration. These ratings are based on climate information drawing on global, quality-controlled data sets from the Climate Change Knowledge Portal (CCKP). The detailed Rapid Assessment Report is attached as **Appendix 14.**

8.7 Conclusion

Both subprojects exemplify a forward-thinking approach to infrastructure development, integrating robust engineering standards and climate-resilient materials to ensure long-term durability. Designed to withstand Assam's challenging tropical climate and seismic activity, it incorporates structural reinforcements, corrosion-resistant materials, and advanced insulation for enhanced stability and efficiency. While future climate variations present ongoing challenges, the project's adaptability, proactive monitoring, and commitment to resilience will ensure its sustained reliability. By prioritizing safety and environmental considerations, this infrastructure stands as a testament to sustainable and future-ready development.

Chapter 9: Institutional Arrangement for Monitoring and Reporting

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 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.

Table 29: Institutional Arrangement for E&S compliance Monitoring

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. Health Safety Officer (1) 5. E&S Support staff (3+3)
**Contractor (EPC)	1. Project Manager (1 – each project site) 2. Community Consultation Officer (1 – each project site) 3. Environmental Health and Safety Officer (HSE) (1 – each project site)

** The nominated officers for all levels are full time basis for the entire project duration.*

*** The staffing pattern will be complied with by the concerned EPC contractor upon completion of the contract signing with AEGCL which is under process.*

Roles and Responsibilities

I. Project Management Unit (PMU)

The Project Management Unit (PMU), led by the Project Director, will include two Environmental and two Social Safeguard Specialists responsible for overseeing all environmental and social (E&S) aspects of the project. Their key responsibilities include reviewing and finalizing the Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plan (ESMP), Resettlement Plans (RPs), and Indigenous Peoples Plans (IPPs); monitoring E&S compliance during project execution; and preparing semi-annual and annual E&S compliance reports for AIIB. The E&S staff will also coordinate with the Project Management Consultant (PMC), EPC contractors, and government agencies to ensure necessary clearances and proper integration of safeguard provisions in contract documents. They will provide guidance to PIUs and contractors, monitor implementation of mitigation measures, and conduct E&S compliance training for all relevant staff.

II. Project Implementation Unit (PIU)

At the PIU level, the Deputy General Manager will serve as the Project Authority, with the Assistant General Manager (AGM) at the divisional level acting as the Project Manager. Designated officers (DM/AM) will be responsible for managing environmental and social (E&S) components and ensuring compliance with AIIB policies. E&S Officers at the divisional level will implement E&S policy guidelines, coordinate with contractors, conduct environmental and social surveys to mitigate adverse impacts, liaise with local authorities for necessary approvals, and carry out site visits to prepare compliance reports.

III. Project Management Consultant (PMC)

The Project Management Consultant (PMC) will provide technical support to the PMU in managing environmental and social (E&S) safeguards. This includes preparing and implementing subproject-specific ESIAs, ESMPs, Resettlement Plans (RPs), and Indigenous Peoples Plans (IPPs), as well as conducting public consultations and community engagement. Environmental and Social Experts within the PMC will ensure compliance with AIIB policies, integrate climate change mitigation measures into project design, review contract documents for ESMP adherence, and prepare compliance reports. They will also deliver capacity-building and E&S training programs for PMU, PIU, and contractor personnel.

IV. EPC Contractor

The contractor is responsible for implementing the Environmental and Social Management Plan (ESMP) and meeting all related environmental and social requirements. This includes preparing and executing the Contractor's ESMP, conducting baseline environmental and social studies, obtaining necessary statutory clearances, organizing public consultations, addressing grievances, and ensuring workers' health and safety through regular training programs. The Contractor's Environmental and Social (E&S) Officer will oversee ESMP implementation, maintain environmental records, ensure regulatory compliance, conduct safety training, and regularly report on ESMP progress and compliance issues.

9.2 Monitoring of ESMP and ESMoP Compliance

To ensure strict adherence to environmental and social standards, the project must be implemented in full compliance with the Environmental and Social Management Planning Framework (ESMPF), the Environmental and Social Impact Assessment and Environmental and Social Management Plan (ESIA-ESMP), and all other Bank-approved instruments. Compliance must also align with the environmental and social obligations outlined in the project's Legal Agreements.

9.2.1 Key Monitoring requirements

The Project Management Unit (PMU) of AEGCL, supported by the Project Management Consultant (PMC), will oversee the environmental and social (E&S) compliance of contractors and site engineers. Their core responsibilities include:

- Ensuring full compliance with the ESMPF, ESIA-ESMP, and legal agreements.
- Conducting regular environmental monitoring of air quality, noise levels, soil, and water during all project phases—pre-construction, construction, and operation.
- Identifying non-compliance issues and implementing timely corrective actions.
- Documenting all monitoring activities and corresponding corrective measures.
- Submitting periodic environmental and social performance reports to the AIIB, with a minimum frequency of once per year.

9.2.2 Monitoring Activities by PMU and PMC

Monitoring efforts will be carried out through coordinated supervision and reporting. Activities include:

- Supervising implementation of E&S safeguard measures across project sites.
- Verifying the availability of all required environmental permits and clearances.
- Monitoring environmental parameters including water, air, noise, soil quality, traffic disruptions, and livelihood impacts.
- Enforcing occupational health and safety (OHS) standards to protect workers and local communities.
- Conducting stakeholder consultations, grievance redressal, and impact mitigation for affected persons.
- Ensuring restoration of livelihoods affected by the project to pre-project levels.
- Preparing regular progress and compliance reports for submission to the funding agency.
- Tracking overall safeguard implementation and outcomes.

Environmental quality assessments will be carried out at three stages—baseline (pre-construction), construction (quarterly), and post-construction—covering all active project locations.

9.2.3 Contractor Compliance Requirements

The contractor (L1) must obtain approval for their Contractor's Environmental and Social Management Plan (C-ESMP) from AIIB before initiating any civil works. Submissions must be reviewed by the PMC and the PMU E&S staff. Key compliance deliverables include:

- Traffic Management Plan: Minimizing disruptions and social impacts on local communities.

- Water Resource Protection Plan: Safeguarding drinking water sources from contamination.
- Wastewater Management Plan: Ensuring safe treatment and disposal, including installation of septic tanks.
- Environmental Monitoring Reports: Submission of pre-construction, construction, and post-construction lab test results (with calibration certificates, photos, and analysis), approved by PMC and AEGCL.
- Boundary Marking and Protection Strategy: Preventing offsite environmental and social impacts.
- Consent and Permit Strategy: Securing all regulatory approvals prior to activities such as quarrying or use of borrow pits.
- GBV/SEA Prevention Plan: Implementing measures to prevent, monitor, and respond to gender-based violence and sexual exploitation and abuse.

9.3 Reporting Line

The mitigation measures outlined in the ESIA/ESMP specific to construction shall be integrated into civil works contracts, and the contractors bear primary responsibility for their implementation. Additionally, contractors must regularly submit monthly Environmental & Social progress reports to the PMC/PMU detailing the execution of ESMP measures. The PMC and PMU – AEGCL is tasked with reporting biannually to AIIB E&S experts on the progress achieved regarding ESMP activities and milestones. These progress reports will furnish comprehensive information, including descriptions of implementable activities and their status, identification of responsible parties overseeing implementation, and the provision of project management schedules, timeframes, and associated costs. The illustration of reporting line is provided in **Figure 27.**

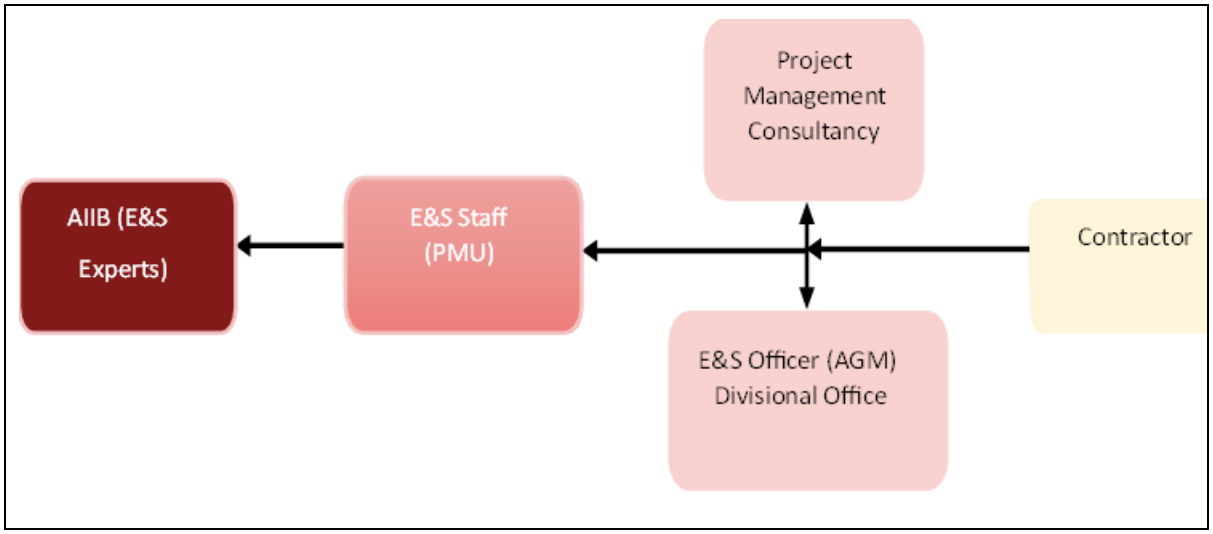


Figure 27 : Reporting line flow-chart

The E&S monitoring report will be submitted by the PMC- E&S staff to the PMU, which will include the details of environmental, social, health & safety monitoring and findings. The Environment and Social Staff of PMU after interaction with PMC E&S staff will ensure the adequacy of submitted monitoring reports and PMU will further submit these reports to AIIB twice in a year. This report will include the results of environmental monitoring to demonstrate that sound environmental

management practices are applied, andthe set environments targets are achieved. Additionally, a quarterly E&S progress report need to be submitted to AEGCL, PMU by the PMC.

In case the implementation of ESMP measures is not satisfactory, AEGCL may engage external qualified experts to verify monitoring reports and assess the significant impacts and risks. These external monitoring experts shall recommend actions for AEGCL to enhance E&S compliance. Funding agency will continue to monitor project compliance with safeguard plans and requirements on an on-going basis throughout the duration of the contract.

9.4 Training Programme and Capacity Building

As per the approved Environmental and Social Management Plan Framework (ESMPF) for Phase-II of the AISTSEP, a series of training programs will be conducted to enhance the capacity of relevant stakeholders. These trainings will focus on the implementation of the Environmental and Social Management Plan (ESMP) and Contractor Environmental and Social Management Plan (CESMP), Health and Safety awareness, implementation of the Grievance Redress Mechanism (GRM), and Occupational Health and Safety (OHS).

The trainings will be provided to the Environment and Social (E&S) officials of EPC contractors and Project Implementation Unit (PIU) by the E&S experts from the Project Management Consultant (PMC) and the E&S specialists from the Project Management Unit (PMU). In addition, Environment and Social experts, Occupational Health and Safety experts may be hired as necessary to conduct specialized training sessions.

The detailed training schedule for Chabua and Titabor is provided below in **Table 30.**

Table 30 : Details of Training Programmes

Sr. No.	Types of Training	Number of Training for Chabua S/S	Number of Training for Titabor S/S
1	Training on Implementation of ESMP for PIU: Once per year for 3 years and EPC contractors: Twice per year for 3 years	9	9
2	Health & Safety Awareness Camp: Pre-Construction- Once Construction- 2 times / year for 3 years Operation- Once	8	8
3	Training on Implementation of GRM and Gender Action Plan (Bi-annually for 3 years)	6	6
4	Training on Occupation Health and Safety (Quarterly for 3 years)	12	12

Chapter 10: Stakeholder & public consultation and information disclosure

The Asian Infrastructure Investment Bank (AIIB) emphasizes the importance of transparency and meaningful consultation in its Environmental and Social Framework (ESF). According to the ESF, AIIB requires its clients to engage with stakeholders throughout the project lifecycle, ensuring that consultations are inclusive, accessible, timely, and conducted in an open manner. This process involves providing adequate information that is understandable and readily accessible to stakeholders in a culturally appropriate manner, enabling their views to be considered in decision-making. The ESF also mandates the establishment of project-level grievance redress mechanisms to address concerns promptly and effectively.

In its Environmental and Social Standard 1 (ESS 1), AIIB outlines specific requirements for stakeholder engagement. Clients are obligated to disclose draft environmental and social assessment reports and related documentation early in the project preparation phase. This disclosure must occur in a timely, accessible, inclusive, and culturally appropriate manner, using language(s) understandable to the project-affected people and other relevant stakeholders. The objective is to provide these stakeholders with an opportunity to identify and address the project's environmental and social risks and impacts, including those involving involuntary resettlement, Indigenous Peoples, and community health and safety aspects, so they can provide meaningful inputs into the design and implementation of the project. ESS 2: Involuntary Resettlement emphasizes the importance of engaging affected people to ensure fair compensation and livelihood restoration in case of land acquisition or displacement. ESS 3: Indigenous Peoples requires culturally appropriate consultation and the Free, Prior, and Informed Consent (FPIC) of Indigenous communities when their rights, lands, or resources are impacted.

In line with the AIIB's Environmental and Social Standards, meaningful stakeholder engagement has been conducted throughout project preparation to ensure concerns and suggestions from communities, and other stakeholders are considered. Following section provides an understanding of the key stakeholder groups identified for the project and their key concerns from the project development.

10.1 Stakeholder Identification

A stakeholder is defined as "an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project." "Stakeholder Analysis" is the process of sorting identified stakeholder groups according to their impact on the project and the impact the project will have on them. This information is then used to assess the manner in which the interests of the stakeholders or the project's impact on them should be addressed in the project development plan or its operation. The identification of stakeholders and their inclusion in the decision-making process is thus essential in the process of prioritizing, analyzing and addressing issues; and in creating management systems and strategies to address the concerns/ expectations of various stakeholders.

10.2 Stakeholder Mapping and Analysis

Stakeholder mapping and analysis are critical processes in project planning and implementation, especially for infrastructure projects like the construction of both proposed 132/33KV Titabar and Chabua substations. It involves systematically identifying all individuals, groups, or organizations that may be affected by or have an influence on the project. Key stakeholders typically include local residents, Government agencies, local governing bodies, Self Help Groups (SHGs), utility service providers, women, and vulnerable groups. Once identified, stakeholders are analyzed based on their level of interest in the project and their potential to influence its outcomes.

The **Table 31** has been used to classify the identified stakeholders (directly or indirectly impacting the Project or being impacted by the project) in accordance to their levels of influence on the Project and the influence of the project on them. The influence and priority have both been primarily rated as:

High Influence: This implies a high degree of influence of the stakeholder/project on the project/stakeholders in terms of participation and decision making or high priority to engage with the stakeholder;
Medium Influence: Which implies a moderate level of influence and participation of the stakeholder/project in the project/stakeholder as well as a priority level to engage the stakeholder which is neither highly critical nor are insignificant in terms of influence.
Low Influence: This implies a low degree of influence of the stakeholder/project on the project/stakeholder in terms of participation and decision making or low priority to engage that stakeholder.

The intermediary categories of low to medium or medium to high primarily imply that their influence and important could vary in that particular range subject to context specific conditions or also based on the responses of the project towards the community.

Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over project at the outset of the project. Therefore, project proponent is advised to consider this stakeholder mapping as a live document which should be revised in a timely manner so as to make it comprehensive for any given period of time.

Table 31 : Stakeholder Consultation Mapping

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
(i) Project-Affected Parties	**People living adjacent to substation sites**	**Potential exposure to construction disturbances (noise, dust, traffic); safety and access concerns.**	Public consultations were conducted with local residents near the proposed Titabor substation site on 31st May 2025 and 18th July 2025. These meetings served as a platform to inform the community about various aspects of the project, including upcoming construction activities, the intended land use for the substation, potential employment opportunities, and the roles and responsibilities of the PIU and PMU officials of AEGCL, along with the EPC contractor. A detailed discussion was held on the Grievance Redressal Mechanism (GRM) and the potential risks associated with Gender-Based Violence (GBV). The consultation emphasized preventive awareness and encouraged community vigilance to address such risks proactively. Attention was also given to minimizing disruptions to nearby residential areas and small tea stalls, with a strong focus on ensuring safety during vehicle movements associated with the project. Environmental concerns such as dust and noise were discussed, with a focus on implementing proper control measures. The community emphasized the need to maintain access to essential services like education and healthcare during construction. While residents expressed strong support for the project due to its potential to reduce power disruptions, they also suggested minimizing noise and heavy vehicle movement at night. Overall, the community welcomed the project and shared constructive inputs on safety and livelihood opportunities. ***Photographs and attendance sheet are appended in Appendix – 15.***	Influence of Stakeholder: Low Influence of Project: Medium

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			During the site visits at Chabua on 30th May 2025 and 17th July 2025, public consultations were conducted with local residents near the proposed substation site. The discussions covered key aspects of the project, including its scope, land availability, potential employment opportunities for local people, and safety measures to be followed during the construction phase. The Grievance Redressal Mechanism (GRM) was explained in detail, and concerns related to Gender-Based Violence (GBV) were also addressed. Residents appreciated the open and inclusive communication and showed interest in exploring small-scale business opportunities during the construction period. They also raised concerns about maintaining uninterrupted access to essential services such as healthcare and education. The community expressed overall support for the project and recommended regular engagement throughout the implementation phase to address any emerging issues. ***Photographs and attendance sheet are appended in Appendix – 16.***	

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
	Tea garden labourers and worker groups (Titabor & Chabua)	**Cultural and land-use considerations, livelihoods etc.**	Titabor Substation: Consultations were conducted on 31st May and 18th July 2025 with workers residing near the proposed substation site at Letekujan Tea Estate, Titabor. The GRM and GBV awareness were explained, and feedback was sought regarding the project's impact. Workers informed the team that they had received prior communication from the tea estate management about the substation project. They confirmed that no tea workers were displaced, and the land for substation construction is located away from residential quarters or critical work areas. There had been no loss of employment, income, or changes in daily work schedules as a result of the land transfer. On the matter of land availability, workers reiterated that the estate had sufficient unutilized grant land and the transferred 1.21 hectares had been compensated internally without affecting overall plantation productivity. They emphasized that the construction did not disrupt their employment and they remained fully engaged in estate operations. Worker expressed their strong support for the project, stating that improved electricity access would benefit tea processing and reduce reliance on diesel generators. **Photographs and attendance sheet are appended in Appendix – 15** **Chabua Substation**: During site visits conducted on 30th May and 17th July 2025, consultations were held with tea garden workers residing near the proposed substation site within Chabua Tea Estate. The project team explained the Grievance Redressal Mechanism (GRM) and discussed issues related to Gender-Based Violence (GBV) and worker safety.	Influence of Stakeholder: Low Influence of Project: Low

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			The workers confirmed that they had been informed about the proposed substation by the tea estate management and were aware of the project. They shared that there was no discontinuation of employment, no reduction in wages, and no displacement or disruption caused by the land transfer to AEGCL for substation construction. They also reported that the substation land parcel was not near labour housing and did not affect their workplace or movement. The workers also expressed that the tea estate has ample unplanted land, and the management had clearly communicated that tea operations would continue as usual. As a result, they did not foresee any impact on work availability or daily routines. Overall, they supported the project and welcomed the initiative, highlighting that frequent power outages hinder processing activities and the upcoming substation would improve electricity reliability in the region. **Photographs and attendance sheet are appended in Appendix – 16.**	
	Local shop owners and households near access roads (within the 500 meters of the construction site)	**May face disruption due to transport of materials and workforce movement during construction activity.**	Consultations at the proposed 132/33 kV substation site in Titabor were held on 31st May 2025 and 18th July 2025. These meetings were conducted with local households and shop owners residing along access roads and within 500 meters of the substation site. The consultations were led by the Environmental and Social (E&S) team of the Project Management Unit (PMU). The E&S team provided an overview of the project's objectives, implementation timeline, potential construction-related impacts, and key safeguards such as the Grievance Redressal Mechanism (GRM) and measures to prevent Gender-Based Violence (GBV).	Influence of Stakeholder: Low Influence of Project: Low

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			Attendees were also informed about the possibility of local employment opportunities during construction. Participants generally welcomed the subproject but raised concerns regarding increased noise, dust, and traffic disturbances during construction. They emphasized the need for strict vehicle speed limits, road safety measures, and dust suppression practices. All suggestions were noted and assurance were provided that appropriate mitigation measures would be implemented to minimize inconvenience and ensure public safety during the construction phase. ***Photographs and attendance sheet are appended in Appendix – 15)*** At Chabua, consultations were carried out on 30th May 2025 and 17th July 2025 with local residents and shop owners located near access roads and within 500 meters of the proposed 132/33 kV substation site. These sessions were facilitated by the PMU's Environmental and Social team. The project team presented details about the planned substation, its purpose, expected benefits, and construction timeline. Key environmental and social considerations were discussed, including the roles of the GRM, GBV prevention measures, and anticipated temporary impacts during construction. Residents expressed support for the substation, recognizing its long-term benefits, particularly in improving power supply reliability. However, they shared concerns about traffic congestion, dust, and construction noise, especially along roads used daily by the community. All feedback was documented, and the team reassured that mitigation measures—such as regulated vehicle movement, noise	

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			control, and dust management protocols—would be enforced. Continued communication during construction was also promised to address any grievances promptly. ***(Photographs and attendance sheet are appended in Appendix – 16)***	
(ii) Interested Parties/ Influence by the project	**District Revenue & Land Administration (Jorhat & Chabua)**	**Land identification and allocation for substations.**	To understand the land transfer process for the proposed substations, discussions were held with relevant land administration offices to understand the background and procedural aspects of site selection. At Titabor, a consultation was held with the Jorhat Land Acquisition Office on **19th July 2025**. Officials shared that the land parcel was jointly identified by AEGCL and the Tea Garden Authority following the non-availability of suitable government land in the area. To facilitate the transfer, compensation was determined in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR Act). The land was described as vacant, with only scattered tea bushes and no built structures, making it appropriate for substation construction. Similarly, at Chabua, a consultation was held with revenue officials of the Chabua Revenue Circle on **17th July 2025**. A similar explanation was provided confirming that the land was selected through mutual agreement between AEGCL and the Tea Garden Authority, and that compensation was determined under the 2013 Act. The land was also noted to be unoccupied, with only tea vegetation and no permanent structures. These discussions reaffirmed that the land transfer process was carried out in a collaborative and transparent manner, based on mutual consent, and in line with applicable legal provisions. **Photographs of these consultations are appended in Appendix–17.**	Influence of Stakeholder: Medium/High Influence of Project: Low
	Tea Garden Authorities (Letekujan and Chabua Estates)	**Tea Garden Land transferred to AEGCL for substation construction.**	**Letekujan Tea Estate (Titabor)** During consultations held on **18th July 2025** with the Managing Director and senior executives of Letekujan Tea Estate (M/s	Influence of Stakeholder: Medium/High Influence of Project: Low

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			Kasojan Tea Company Pvt. Ltd.), it was confirmed that the transfer of land for the proposed 132/33 kV substation at Titabor was finalized through a mutual negotiation process between AEGCL and the tea estate management (Refer **Appendix 5** for letter from garden Authority). After exploring various site options, the selected parcel was agreed upon based on its low cultivation value and minimal potential for livelihood disruption. The District Administration subsequently facilitated the formal land transfer, and the compensation amount was calculated in accordance with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCTLARR) Act, 2013. The tea estate management further confirmed that the compensation funds will be reinvested to develop unutilized areas within the estate for future tea plantation activities. The **1.21-hectare** land parcel transferred to AEGCL lies within the total grant area of **303.61 hectares**, of which **229.80 hectares** are currently under tea plantation. The transferred land did not include worker housing, core infrastructure, or labour quarters, and its use for substation construction has caused no loss of employment or reduction in worker engagement. The estate employs 312 permanent workers (92 male and 220 female) and 250 seasonal workers (80 male and 170 female), all of whom continue to be engaged without interruption. **Photographs and attendance sheet are appended in Appendix – 18** **Chabua Tea Estate** Similarly, on **17th July 2025**, discussions were held with the Senior Manager and Assistant Manager of Chabua Tea Estate (managed by Amalgamated Plantations Pvt. Ltd.) regarding the land transferred for the 132/33 kV substation at Chabua. The tea estate authorities shared that the land transfer to AEGCL was conducted through a negotiated process, following internal assessment of	

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			available land within the estate (Refer **Appendix 7** for letter from garden Authority). A suitable plot was identified that would not interfere with existing plantation operations or the well-being of the workforce. The **3.62-hectare** land parcel was selected from a less productive area of the estate, and its transfer did not involve any labour housing, community assets, or critical tea processing infrastructure. The tea estate confirmed that it has ample surplus land, allowing for internal adjustments without any negative impact on tea production or labour engagement. The compensation provided as per the RFCTLARR Act, 2013, is being utilized for expanding plantation activities in other vacant areas within the grant. Chabua Tea Estate has a total grant area of **1,309.76 hectares**, of which **760.42 hectares** are currently under tea cultivation. It employs a significantly large workforce comprising 1,666 permanent workers (710 male and 956 female) and 1,200 seasonal workers (550 male and 650 female). The estate management confirmed that the substation development has not caused any employment loss, resettlement, or disruption to worker routines. **Photographs and attendance sheet are appended in Appendix – 19**	
	Local SHGs/community organizations	May support or monitor environmental and social performance; act as community liaisons.	On 17th July 2025, formal consultations were conducted at Chabua with members of the Village Organizations (Self Help Groups), namely THAPANA, SHOPUN, JOYMOTI, VIRANGANA, PERANA and GAMUSHA. During the meeting, participants were briefed on key aspects of the proposed project, including its objectives, the Grievance Redress Mechanism (GRM), potential risks associated with Gender-Based Violence (GBV), and the anticipated impacts of labour influx during the construction phase. The community members highlighted existing issues in the area, particularly frequent power disruptions and low voltage, which affect daily life. They expressed strong support for the project and welcomed its	Influence of Stakeholder: Low Influence of Project: Low

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			implementation, noting that it would help address current electricity challenges. Additionally, they requested that local residents be given priority for temporary employment opportunities during the construction period. ***Photographs and attendance sheet are appended in Appendix – 20.*** On 18th July 2025, a consultation was held at Titabar with members of the ANAJORI Self Help Group (SHG), during which they were briefed on various aspects of the proposed project. The discussion included information on the project's objectives, the Grievance Redress Mechanism (GRM), potential risks related to Gender-Based Violence (GBV), and possible impacts from labour influx during the construction phase. The community members expressed strong support for the project and positively welcomed its implementation. They also requested that temporary employment opportunities be provided to local residents during the construction period. ***Photographs and attendance sheet are appended in Appendix – 21.***	
(iii) Vulnerable Groups	Economically weaker people near project areas	May lack capacity to voice concerns; sensitive to price changes or livelihood disruptions.	Consultations with economically weaker sections of the local population, particularly tea garden workers were held near the proposed Titabor substation site on **31st May 2025** and **18th July 2025**, in the presence of project officials. Local residents expressed strong support for the subproject and welcomed its implementation. Many attendees showed interest in livelihood opportunities associated with the project. Several individuals expressed willingness to take up unskilled labour roles, while others shared plans to set up small food and refreshment stalls to serve the construction workforce during both the construction and operational phases.	Influence of Stakeholder: Low Influence of Project: Medium

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			Tea garden workers, especially those not employed on a permanent basis, indicated that their work is largely seasonal and concentrated during the peak tea production period from May to September. As a result, they face underemployment during the rest of the year and viewed the project as an opportunity to supplement their income. Many expressed willingness to take up construction-related and other non-skilled work, such as helpers or night guards, if such opportunities arise. Their feedback was recorded for consideration during project planning and implementation. ***Photographs and attendance sheet are appended in Appendix – 15*** Similar consultations were conducted with economically weaker sections—mainly tea garden workers—near the proposed Chabua substation site on **30th May 2025** and **17th July 2025**, in the presence of project officials. Residents were briefed about the project's scope, anticipated timeline, and key social safeguards including the Grievance Redress Mechanism (GRM), Gender-Based Violence (GBV) prevention, and labour influx management during construction. The community welcomed the subproject and expressed strong support. Many participants showed interest in temporary income-generating opportunities, with some willing to engage in unskilled construction work, while others proposed to run small-scale food stalls or shops to cater to construction crews and project staff. Tea garden workers shared that they are typically employed only during the peak production season from May to September, and often face reduced employment opportunities for the remainder of the year. The project was therefore seen as a welcome opportunity to secure short-term employment and improve	

Category	Stakeholder	Influence of the project on Stakeholder / Influence of the Stakeholder on project	Concerns and expectations from the Project	Influence Rating
			household income. Their suggestions were acknowledged and will be considered in the planning and implementation process. ***Photographs and attendance sheet are appended in Appendix – 16***	
	Women Groups (Women SHGs)	May face disproportionate impacts from construction or social changes.	Stakeholder consultations were held at Chabua on 17th July 2025 and at Titabor on 18th July 2025 with active participation from women's groups and local community members residing near the proposed substation sites. Facilitated by the presidents and secretaries of local Self-Help Groups (SHGs), the sessions covered the project's objectives, the roles of AEGCL, the EPC contractor, and AIIB as the funding agency. Participants were informed about the Grievance Redressal Mechanism (GRC), potential Gender-Based Violence (GBV) risks during construction, and measures for community vigilance. The consultations also included a focused discussion on the implementation of the project's Gender Action Plan (GAP). SHG leaders and community members were briefed on how the GAP aims to ensure gender-responsive project planning, promote women's participation in local employment, and support their entrepreneurial activities—especially through linkages with small businesses and services during the construction phase. Women attendees were encouraged to engage actively with project stakeholders and monitor the effectiveness of GAP-related initiatives. Discussions also emphasized local employment opportunities, particularly in unskilled labour roles and micro-enterprises such as food stalls or service kiosks. SHG members welcomed the project, appreciated the inclusive consultation process, and acknowledged the long-term benefits of improved electricity supply and the potential for economic support to MSMEs. **(Photographs and attendance sheet are appended in Appendix – 15 & 20 and 16 & 21)**	Influence of Stakeholder: Low Influence of Project: Medium

10.3 Public Consultation

Public consultation sessions were conducted near the proposed 132/33 kV substation sites at Chabua and Titabor on 30th and 31st May 2025, and subsequently on 17th and 18th July 2025, to ensure broad-based community engagement and feedback. These sessions involved a diverse group of community, including tea garden workers (permanent and seasonal), economically weaker households, local shop owners, Self-Help Groups (SHGs), and women's groups residing in and around the project areas.

Given that both substations are to be constructed within tea estate land, particular attention was given to tea garden workers, many of whom expressed interest in temporary employment opportunities during the construction phase. Seasonal workers, who typically face underemployment outside the peak tea harvesting period (May to September), welcomed the possibility of engaging in non-skilled roles such as construction labourers, night guards, or helpers. They saw the project as an opportunity to supplement their income without affecting their regular tea garden work.

Consultations with women's groups and SHGs emphasized the need for inclusive participation. The sessions included a briefing on the Gender Action Plan (GAP), focusing on women's involvement in project-related employment, entrepreneurial opportunities (e.g., food stalls or service kiosks), and community-based monitoring of project impacts. The Grievance Redressal Mechanism (GRM) and Gender-Based Violence (GBV) prevention measures were also discussed. Women participants appreciated the attention to gender-sensitive safeguards and highlighted the importance of continued engagement throughout implementation.

Local households and shop owners near access roads raised concerns about construction-phase impacts, including dust, noise, traffic safety, and access disruptions. The project team explained the planned mitigation measures, such as dust control, regulated vehicle movement, and regular communication with affected communities.

Across all locations, participants expressed strong support for the project and recognized the long-term benefits, including improved electricity supply, reduced power outages, and local economic opportunities. Suggestions and feedback from these consultations have been documented for integration into project planning and environmental and social management measures.

Photographs and attendance sheets from all sessions are provided in **Appendices 15 & 16.**

The consultation questionnaire format is provided in **Appendix – 22**, and a summary of community feedback based on the structured questionnaire is presented in **Table 32.**

Table 32 : Summary of Public Consultation

Issues Discussed	People's views and perceptions
General Perception	The majority of tea garden workers were already aware of the proposed substation and associated activities, as the tea garden authority had informed them that the substation would be constructed on a section of the estate where tea leaf production is limited. However, the formal consultation sessions held during the site visits provided the workers with a clearer understanding of the project's objectives, scope, and potential benefits. Following these discussions, nearly all participants expressed a positive outlook and extended their support for the construction of the proposed substations and related infrastructure.
Support of local people for the construction of	Most community members expressed strong support for the construction of the proposed substations, recognizing the project's potential to significantly enhance local

Issues Discussed	People's views and perceptions
proposed substations and associated activities	infrastructure and improve overall quality of life. They appreciated the efforts of the implementing agency in promoting rural electrification and acknowledged the substations as a vital part of this initiative. Residents were hopeful that persistent issues such as low voltage and unreliable power supply would be effectively resolved. Additionally, the majority of participants conveyed confidence that the project would not pose any risk to their safety.
Critical issue and concern by the local people for the substation locations	Most community members did not raise any major concerns regarding the establishment of the proposed substations. However, they recommended that certain precautionary measures be implemented during the construction phase, such as enforcing speed limits for heavy vehicle movement at the site, minimizing noise during nighttime hours, and taking necessary steps to prevent risks such as snake bites.
Project site selection criteria	During the consultation process at Chabua and Titabor, the community did not raise any significant social or environmental concerns, nor did they express any objections, as the proposed substations are to be constructed within tea garden areas. However, some participants emphasized the importance of implementing appropriate safety measures to ensure the protection of workers and nearby residents during the construction phase.
Employment potential in the construction of substations	During consultations, tea garden workers—particularly seasonal (non-permanent) workers—expressed strong interest in temporary project-related employment opportunities. These seasonal workers, typically engaged during the peak tea production season (May to September), face underemployment during the rest of the year. They saw the project as a timely opportunity to supplement their income through roles such as construction labourers, night guards, and helpers. As per discussions with the tea garden authorities, Letekujan Tea Estate (Titabor) employs 312 permanent workers and 250 seasonal workers, while Chabua Tea Estate employs 1,666 permanent and 1,200 seasonal workers. Additionally, women's SHG members expressed interest in setting up food stalls or small service outlets during the construction phase to support the workforce.
Socio economic standing: land use, cropping pattern	The primary sources of livelihood for the communities include tea garden work, agriculture, wage labor, and small businesses. Most community members engage in single cropping annually, predominantly cultivating paddy, tea plantation and vegetables.
Source of drinking water	The primary source of drinking water for the communities is hand pumps. Other sources include water supplied by the Public Health Engineering (PHE) department, along with a few ring wells and bore wells. Some community members reported filtering their water before drinking, while others consume it without any filtration.
Negative impact on food grain, availability / land use	No negative impact on food grain availability or land use is anticipated, as the tea garden authority has provided a written assurance stating that, in order to avoid any unforeseen impact on tea production due to the proposed land allocation, any affected area would be compensated by adjusting or shifting production to other parts of the estate. This proactive mitigation strategy has been adopted to ensure the continuity of tea estate operations and to safeguard the livelihoods of tea garden workers.
Will project cause widespread imbalance by cutting fruit and commercial trees in the locality	Approx. 6 nos. and 92 nos. of Siris trees (*Albizia lebbeck*) are proposed to be felled in the proposed 132/33kV Titabor GIS site and 132/33kV Chabua AIS site respectively. These trees are proposed to be felled to allow for site clearance and the commencement of construction activities. No cutting of trees outside the sub-project sites will be carried out.

Issues Discussed	People's views and perceptions
Will project cause health and safety issues	Most community members did not anticipate any major health or safety issues arising from the proposed construction of the substations. However, some participants recommended that adequate safety measures and precautions be implemented during the construction phase to ensure the well-being of workers and nearby residents.
Protected areas	Based on the feedback gathered from the community and the observations made during the visit, it was confirmed that the sub-project site is neither located within nor adjacent to any designated Protected Areas (PAs), Eco-sensitive Zones (ESZs), or Critical Habitats.
Will project setting change migration pattern of animals	None of the communities consulted reported the presence of migratory birds or animals in or around the proposed substation sites. As a result, they did not anticipate any impact on wildlife, including birds, animals, or their habitats, due to the construction of the proposed substations.
Migration pattern	During the consultations, community members reported that some youth had migrated from the area in search of better employment opportunities. Common destinations included Bangalore, Gujarat and Hyderabad, where they were primarily engaged in factory and industrial sector jobs.
Perceived benefits from project	Across the communities, the majority of participants believed that the proposed substations would significantly help in addressing the prevailing energy challenges, such as frequent load shedding and low voltage issues in the region. Many viewed the project as a step forward in strengthening rural electrification, which could encourage the establishment of small and medium-sized businesses. At the community level, residents expressed hope that the project would lead to more reliable and consistent power supply to households, thereby improving overall quality of life.
Perceived loss	No loss of land, crop, or employment was reported. Workers confirmed that the substation sites were located away from residential and core work areas, and the transfer did not affect daily work routines. Discussions with Tea Garden Authorities confirmed that the land allocated to AEGCL did not impact housing or active plantation zones. Both permanent and seasonal workers continue to be fully engaged in estate operations, and employment levels remain unaffected.

10.4 Continuous Consultation and Participation

Project Management Consultant (PMC), will ensure meaningful and ongoing consultation in line with AIIB requirements. Monthly consultations will be conducted by the PIU, PMC, and the EPC Contractor with local communities near the proposed Chabua and Titabor substations to engage affected persons and other relevant stakeholders, including civil society, and to promote their informed participation.

The consultation process will:

a. Begin at the subproject preparation stage and continue throughout the entire project cycle.
b. Ensure timely disclosure of relevant information in a manner that is accessible, understandable, and inclusive—particularly for women, vulnerable, and disadvantaged groups.
c. Be carried out in a non-coercive and open environment, encouraging free and honest feedback.
d. Be gender-inclusive and responsive, and tailored to meet the specific needs of marginalized groups.
e. Allow for the incorporation of community input into decision-making processes, including project design, mitigation measures, benefit-sharing, and implementation.

The extent and frequency of consultations will be proportional to the project's impact on local communities. All consultations and their outcomes will be documented and reported in the Environmental and Social Monitoring Reports.

Feedback from Project Affected Persons (PAPs) will be collected regularly during consultations. In case of grievances, PAPs may approach the Grievance Redress Committee (GRC) for resolution.

10.5 Public Consultation Information Disclosure

Information disclosure is a fundamental component of the stakeholder engagement process for AIIB-financed projects. It ensures that affected people, interested parties, and the broader public have timely, transparent, and inclusive access to project-related information in accordance with the AIIB Environmental and Social Framework (ESF, 2024) and applicable national laws, including the Right to Information (RTI) Act, 2005). The ESF highlights the importance of early and continuous disclosure to allow stakeholders to understand the potential environmental and social risks and impacts of a project and to contribute meaningfully to decision-making processes. By making relevant documentation—such as Environmental and Social Impact Assessments (ESIAs), Environmental and Social Management Plans (ESMPs), monitoring reports, and updates—readily accessible and understandable, aiming to foster transparency, promote accountability, and build public trust. Disclosure will be conducted in a culturally appropriate manner, using local languages and formats suitable for affected communities, and will also support compliance monitoring and stakeholder feedback mechanisms throughout the project lifecycle.

The final Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) and the semi-annual Environmental and Social Monitoring Reports will be disclosed on the AIIB and AEGCL websites.

Their hardcopies of ESIA-ESMP with executive summary in Assamese language and the semi-annual Environmental and Social Monitoring Reports will be available at the following locations-

i) Project Director cum CGM(PP&D),
Address: 1st Floor, AEGCL, Bijulee Bhawan,
Contact No.: 0361-2739520
Website: www.aegcl.co.in
ii) Project Manager cum AGM, Dibrugah (for Chabua S/S)
Address: - AGM, 132 kV Dibrugarh GSS, AEGCL
Email: agm.dibrugarh@aegcl.co.in
iii) Project Manager cum AGM, Golaghat (for Titabor S/S)
Address: AGM, T &T Division, Golaghat, AEGCL
Email: agm.golaghat@aegcl.co.in

The PMC, concern EPC contractor and PIU, officials of AEGCL will ensure that relevant environmental and social information from these documents is made available to affected communities and stakeholders in a timely, accessible, inclusive, and culturally appropriate manner, including translation into local language(s), particularly Assamese.

10.5.1 Tools and Methods for Information Disclosure

AEGCL, with support from PMC and other stakeholders, will use a combination of printed materials and community engagement sessions to share information, ensuring transparency and accessibility:

- Brochures: Containing information on the project, land requirements, compensation entitlements, and assistance packages. To be made available at local offices.
- Posters: Displayed at prominent public places in the project area.
- Leaflets: Distributed within the project impact zone.
- Executive Summary of ESIA/ESMP: Translated into Assamese and made available in, project offices, and on AEGCL's website.

In addition, community consultation meetings will be organized regularly to update communities and other stakeholders on projects environmental and social aspects.

10.5.2 Contribution to Monitoring and Accountability

Transparent disclosure will enhance project governance, accountability, and public trust, and strengthen monitoring indicators. This will support AIIB in assessing compliance with its environmental and social requirements and evaluating project outcomes.

Chapter 11: Gender Action Plan (GAP)

11.1 Purpose of the GAP

The Gender Action Plan (GAP) for the 132/33kV GIS Substation at Titabor and the 132/33kV AIS Substation at Chabua aims to ensure equitable participation and benefit-sharing for both women and men throughout the subproject lifecycle. Situated in rural Assam, including tea garden and agrarian communities, these subproject areas exhibit gender-based disparities in literacy, mobility, employment, and access to services, as indicated in Census 2011 data. The GAP is designed to address these imbalances by integrating gender-responsive strategies across all stages of project planning and implementation.

The plan focuses on enabling women's involvement in local consultation processes, skill development programs, and employment opportunities related to civil works and operations. Special emphasis is placed on ensuring that women especially those from marginalized groups and tea garden communities gain access to vocational training and economic opportunities traditionally dominated by men. It also encourages the participation of women in local planning platforms, promoting their inclusion in decision-making and leadership roles at the community level.

Furthermore, the GAP aims to enhance women's roles in decision-making and leadership within local institutions and community-based platforms. It also prioritizes minimizing any adverse social or economic impacts on women, particularly in cases of livelihood loss or disruption of local services. To strengthen accountability and responsiveness, the plan includes provisions for women's active involvement in the Grievance Redress Mechanism (GRM) by establishing safe, accessible, and dedicated channels for feedback, encouraging women's representation, and ensuring their concerns are effectively addressed. Overall, the GAP contributes to a gender-responsive and socially sustainable approach to substation development, helping to close existing gender gaps and enhance the long-term social acceptability of the subproject.

11.2 Gender Analysis

Assam's gender-wise employment and earnings data reveal deep-rooted disparities in economic participation and income between men and women. As per the Census of India 2011, the Worker Participation Rate (WPR) for males in Assam stood at 53.59%, while for females it was significantly lower at 22.46%, with women comprising only about 28.6% of the total workforce. The workforce was further divided into main and marginal workers, where 7.03 million men were main workers compared to only 1.65 million women, while a large portion of working women, approximately 1.78 million were engaged as marginal workers, indicating seasonal or irregular employment patterns.

The 132/33 kV GIS Substation at Titabor, located in Jorhat district, is situated in a predominantly agrarian and plantation-based economy. The district-level female literacy rate is 73.46%, compared to 83.42% for males, revealing a gender gap of nearly 10 percentage points. Women in Titabor are largely involved in unpaid domestic work, agricultural activities, and tea garden labor, often in low-paying, unorganized roles. Their participation in skilled or technical employment, including construction and infrastructure sectors, is limited by barriers such as lack of formal education, inadequate training opportunities, and mobility restrictions imposed by social norms. Land ownership is mostly male-dominated, and women's participation in local governance and planning processes remains minimal. Although self-help groups (SHGs) and a few NGOs are active in the area, their influence on infrastructure-related decision-making or economic empowerment programs for women is constrained by limited capacity and reach.

The 132/33 kV AIS Substation at Chabua, situated in Dibrugarh district, falls within Assam's major tea-growing region. The district's female literacy rate stands at 68.96%, significantly below the male literacy rate of 82.82%. A large proportion of women in Chabua and surrounding areas are employed as tea garden workers, primarily in physically demanding and low-wage jobs without formal contracts or social protection. The labour profile in this region is characterized by intergenerational employment in tea estates, with women contributing substantially to plantation output but remaining excluded from supervisory roles, financial decision-making, and institutional planning. Land rights and access to government livelihood schemes are limited for women, and their presence in public consultations or grievance redress forums is low due to cultural restrictions and domestic responsibilities.

These structural and cultural inequalities across both project locations underscore the need for a robust Gender Action Plan that promotes women's participation in consultation, employment, and benefit-sharing while ensuring their representation in decision-making platforms related to the subprojects.

11.3 Measures to Address Gender Issues and Action Plan

The Gender Action Plan (GAP) will be implemented throughout all phases of the subproject to ensure that women in the subproject area benefit meaningfully and equitably. The GAP emphasizes the importance of engaging women in a free, prior, and informed manner across all activities, from planning and consultation to implementation and monitoring. Specific actions will be undertaken to facilitate women's active participation in the subproject and to ensure they receive fair access to employment, resources, and decision-making opportunities. These measures also aim to mitigate any potential adverse social and economic impacts, particularly those affecting women due to construction activities, or safety concerns.

To monitor the effectiveness of gender inclusion, several key indicators will be tracked regularly. These include the number of women employed as a percentage of the total workforce involved in construction activities, and the number of women receiving equal wages as their male counterparts for performing similar work. The subproject will also ensure the provision of basic amenities at construction sites, including safe and separate toilet facilities for women workers. Additionally, an "Internal Complaints Committee" will be established in line with legal provisions to address and register cases of sexual harassment, ensuring a safe and supportive work environment for women. These combined actions will help ensure that gender equity is embedded in subproject processes and outcomes, while fostering a more inclusive and accountable implementation framework.

Table 33 : Gender Issues and action plan

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 resources and the employment of local workers and to maximize use of women (at least 30%) in labour-based work (wherever feasible)	Construction phase	EPC / PMC/ PIU/ PMU	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	EPC Contractors/ PMC/ PIU/ PMU	All workers (both women and men doing same work) receive same wage and reflected in payroll.

Issues	Measures	Applicability	Responsible Agency	Monitoring Indicators
Employment announcement	Announce employment opportunities and recruitment notices widely, targeted at women as well as men.	Pre-construction phase	EPC contractor	Notice of employment opportunity published in local newspapers/ cable channels/ village panchayet office or Municipality ward offices/ outside the construction site, etc.
Employment Opportunities	Technical training can be provided to the local workforce, especially women for inclusion in operation and maintenance phase.	Operational phase	PIU/PMU	Can target minimum 25 % women
Availability of basic facilities	Ensure basic facilities (separate toilets, clean water, drinking water facilities, resting place, crèche) are provided for female workers at the construction site.	Construction and Operational phase	To be implemented by the contractors and to be ensured by PMC, PIU and PMU	All facilities available at the construction site and used by the women workers
B. Women Residing in Adjacent Settlements of Subproject Area				
Livelihood	Preference may be given to women from subproject 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
Safety and Security concerns	Establish Internal Complaints Committee for women workers at site as per prevailing law, Code of conduct will be enforced and awareness on GBV.	Construction phase	Contractor	Number of safety and security related complaints registered with GRC.

11.4 Implementation Arrangements

The implementation of the Gender Action Plan (GAP) will be coordinated through a well-defined institutional framework involving key stakeholders at multiple levels. The Subproject Management Unit (PMU) of AEGCL will hold overall responsibility for GAP execution, with support from the Project Management Consultant (PMC) and EPC contractor. Specific institutional roles will include the designation of Environmental and Social (E&S) officers within both the PMU and PMC to oversee gender-related activities and ensure compliance with GAP commitments. Additionally, the EPC contractor will appoint a dedicated Community Consultation Officer responsible for facilitating inclusive community engagement and ensuring that women's voices are adequately represented during implementation. To strengthen the effectiveness of these arrangements, targeted capacity building will be conducted for all implementing partners, including contractors, field staff, and community liaisons. Training programs will focus on gender-sensitive practices, inclusive communication, equitable benefit-sharing, and grievance handling to ensure that gender considerations are integrated at every stage of the subproject.

11.5 Monitoring and Reporting

GAP implementation will be systematically monitored and reported through established Environmental and Social (E&S) reporting mechanisms. Gender-related progress and indicators will be incorporated into the quarterly and semi-annual E&S monitoring reports prepared by the Subproject Management Consultant (PMC). The semi-annual reports will be submitted to AIIB for review and feedback. In addition, EPC contractor will include GAP-related indicators in their monthly E&S progress reports to ensure consistent tracking at the implementation level. Furthermore, the PMC's monthly site visit reports will also include a dedicated section on GAP monitoring to capture field-level observations, progress against targets, and any emerging gender-related issues requiring attention.

Chapter 12: Grievance Redress Mechanism

The Assam Intra-State Transmission System Enhancement Project (Phase II) aims to strengthen and modernize Assam's electricity transmission infrastructure. Funded by the Asian Infrastructure Investment Bank (AIIB), the project complies with AIIB's Environmental and Social Framework (ESF) and its Policy on the Project-Affected People's Mechanism.

As part of this commitment, an Environmental and Social Management and Planning Framework (ESMPF) has been developed and is publicly available on the Assam Electricity Grid Corporation Limited (AEGCL) website. The ESMPF ensures that the project is implemented in an environmentally and socially responsible manner, prioritizing the concerns of affected communities and stakeholders. To facilitate this, a multi-tiered Grievance Redress Mechanism (GRM) will be established for all subproject components.

The GRM is a free system that registers and attempts to resolve concerns or complaints by Project-affected people (PAPs) or workers/employees arising from project activities. This process aims to quick resolve of disputes and avoids litigation, thus ensuring the smooth implementation of the project activities.

Every person, man, woman, or construction worker employed in Project activities, who feels that they have been adversely affected by the Project, can file their concerns **for free** to the GRM. **The Project guarantees that there will be no reprisals or retributions for raising grievances**. The GRM process does not prevent project affected people to seek their rights through the judicial system but provides an additional and free way to resolve problems. Anonymous grievances are acceptable, but it will be impossible to inform the complainant of the outcome. In this case, the grievance and the proposed resolution will be publicized on site.

At all levels of the project Grievance Redress Mechanism, the Grievance Redress Committee members should uphold the objectives of the GRM and strive to achieve them.

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.

11.1 Constitution of Grievance Redressal Committee

The construction activities under the Project may cause some minor disturbances to the physical environment and communities. These are typical of civil works, such as generating dust, noise, air pollution, and construction debris, influx of construction workers and limited need to acquire permanently or temporary land. Thus, a multi-tiered Grievance Redressal Committee (GRC) will be applicable to the project in its entirety. To honor the GRM, Assam Electrical Grid Corporation Limited (AEGCL) will adopt the practice to resolve any major/ minor grievances, where AEGCL shall accept, review and address issues or problems raised by Project Affected Persons (PAPs), local people and project workers related to project works. GRC will review grievances involving all resettlement benefits, compensation, relocation, replacement cost, other additional assistance for vulnerable groups including Indigenous Peoples (IPs) and grievances related to environmental issues (if any).

As per the Environmental and Social Management and Planning Framework (ESMPF) guidelines, a multi-tiered Grievance Redress Mechanism (GRM) will be established for all subproject components to ensure transparency and accountability. The GRM will consist of two levels of committees:

- **Tier I** – Operates at the field level.
- **Tier II** – Functions at the Project Management Unit (PMU) / Headquarters level.

This structure ensures efficient grievance resolution and supports the smooth implementation of the project.

Following the ESMPF guidelines, **Tier I** and **Tier II** Grievance Redress Committees (GRC) have been established for the **Chabua and Titabor Substations construction site** to ensure effective grievance resolution, transparency, and accountability. The composition of the Tier I GRC for Chabua and Titabor S/S is provided below in **Table No. 34 & Table No. 35** respectively, and Tier II GRCs is provided below in **Table 36**.

Table 34 : : Composition of the Tier I GRCs for proposed Chabua S/S

Sl. No.	Officials nominated		Designation in the Committee
1	Deputy General Manager, Tezpur T&T Circle.	Smt. Mousumi Bori	Chairman
2	Circle Officers, Chabua Revenue Circle		Deputy Chairman
3	Assistant General Manager, Dibrugarh GSS, AEGCL (Project Manager)	Sri Prakash Borah	Member
4	Assistant General Manager, Tinsukia GSS, AEGCL (Project Manager)	Sri Anganjyoti Gohain	Member
5	Member of Pulunga GP, Chabua	Sri Rinku Borah	Member
6	Ward member, Pulunga GP, Chabua Tea Estate No. 44/151 ORR Grant	Smt. Rina Dhengra	Member
7	Village Pradhan (Gaon Burha), Chabua Tea Estate No. 44/151 ORR Grant	Sri Himanta Borah	Member
8	Secretary, AATSA, Chabua Regional Committee.	Sri Gautam Sanga	Member
9	Residential Engineer of AEGCL	To be added	Member
10	Represenattaive of EPC Contractor	To be added	Member

Table 35 : : Composition of the Tier I GRCs for proposed Titabor S/S

Sl. No.	Officials nominated		Designation in the Committee
1	Deputy General Manager, Tezpur T&T Circle.	Sri Probin Roy	Chairman
2	Additional Deputy Commissioner, Jorhat	Sri Satyajit Chetia	Deputy Chairman
3	Assistant General Manager, Mariani GSS, AEGCL (Project Manager)	Sri Debasish Barman	Member
4	Assistant General Manager, Golaghat GSS, AEGCL (Project Manager)	Sri Archan Goswami	Member
5	Representative of Local Panchayat/Council, 53 No.	Smt. Rekhamoni Borah	Member

Sl. No.	Officials nominated		Designation in the Committee
	Garmur Gram Panchayat		
6	Secretary of SNEHPAD NGO, Jorhat	Sri Prakash Thakur	Member
7	Resident Engineer, 132kV Jorhat (West) GSS, AEGCL.	Sri Pallav Jyoti Mahanta	Member
8	Representative of EPC Contractor	To be added	Member

Table 36 : Composition of the Tier II GRCs

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.	Representative of EPC contractor (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.

11.2 Grievance Redressal Procedures

E&S officers of PMU and PMC shall undertake GRM's initiatives that include procedures of communicating the existence of the GRM, taking/recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders, escalating unresolved issues while paying particular attention to the impacts on vulnerable groups. Error! Reference source not found.**Figure 28** e laborates the procedures.

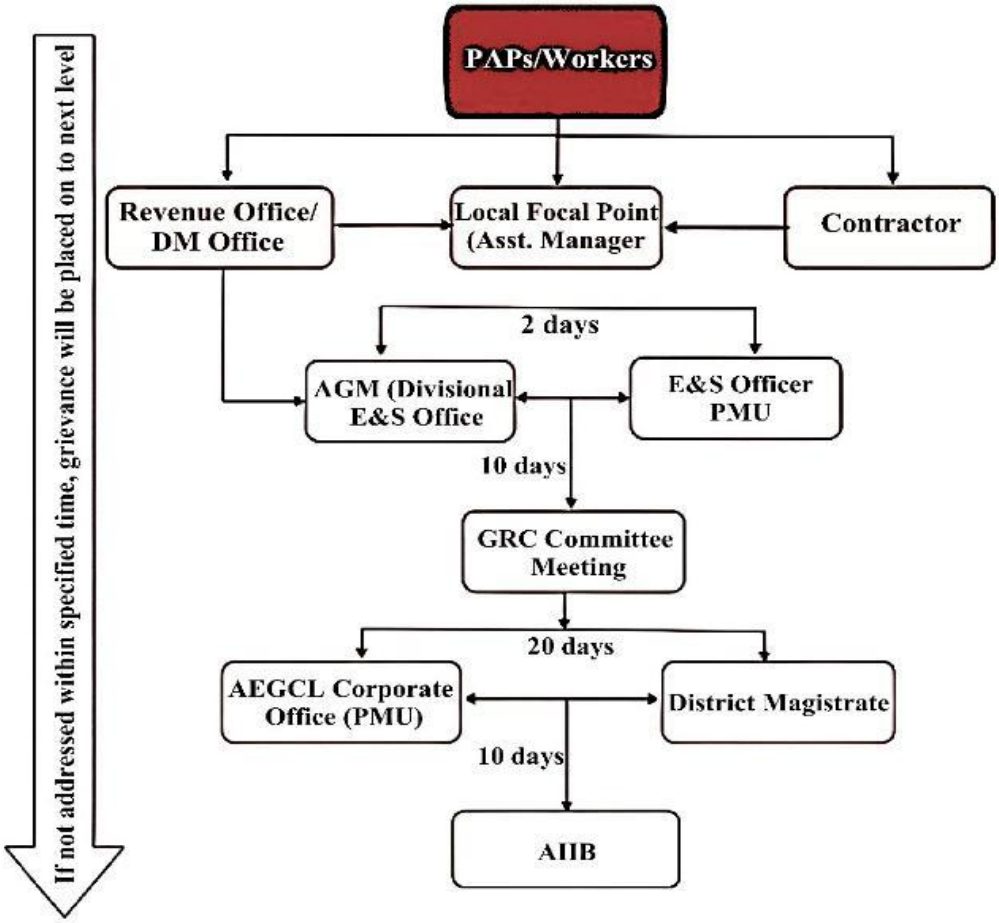


Figure 28 : Grievance Redressal Procedures

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. The GRM for the project should provide an effective approach for complaints and resolution 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 but attempts to minimize use of it to the extent possible.

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.

Complaints which may be arises during the project implementation period (Pre Construction, During Construction and Post Construction) will be handled according to the following procedure:

1. Project-affected person approaches a member of the GRC (Tier-1) in person or via the phone/WhatsApp. (Dedicated phone number will be assigned)
2. The GRC (Tier 1) member receives the grievances and records the details in the GRM logbook.
3. The GRC (Tier-1) acknowledges the receipt of the grievance within one day and provides a dated proof (official slip, text or WhatsApp message).

4. The GRC (Tier-1) gathers information, visits site and interviews people to evaluate if they can find a resolution of the grievance within 10 working days.
5. The GRC (Tier-1) informs grieved party of the proposed resolution in writing.
    a. Grieved party can accept the proposed solution, which is duly recorded.
    b. Grieved party may not accept the proposed solution, which is duly recorded.
6. If the GRC (Tier-1) is unable to find a solution, or if the grieved party does not accept the proposition, the GRC (Tier-1) can automatically escalate the issue to the Tier -2 GRC, if grieved party agrees.
7. The Tier-2 GRC acknowledges the receipt of the grievance and provides a dated proof (official slip, text or WhatsApp message).
8. The Tier 2 GRC gathers information, visits site and interviews people to evaluate if they can find a resolution of the grievance within 20 working days.
9. The Tier 2 GRC informs grieved party of the proposed resolution in writing.
    a. Grieved party can accept the proposed solution, which is duly recorded.
    b. Grieved party may not accept the proposed solution, which is duly recorded.
10. The grieved party may seek their rights in the court of law.
11. If any unwanted situation like danger, sexual harassment and other life threatening, the victim person may reach to the concerned officials who belong to the Tier-1 and Tier-2 committee and may contact for further needful action or the matter should be informed to AIIB immediately.

Table 37 : 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 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/Pandemic 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

Common Grievance Categories	Issues and Likely Solutions
	➢ 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/other Pandemic 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.

11.3 Recording, Monitoring, Reporting and Evaluation

The GRM system shall keep a grievance register log. Each grievance will be recorded in the register (**Refer Appendix 23**) 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 timely resolution of grievance. The indicators will be measured within the regular E&S Monitoring report. The indicators 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 any patterns or repetition of issues that need addressing. The Project Manager may decide to get an independent consultant to review and provide advice.

DOs and DON'Ts for GRC Members

DOs	DON'Ts
➢ **Respect** complaints. ➢ Follow the established GRM procedures ➢ Popularize the GRM's existence, accessibility, and free access. ➢ Establish accessible compliant receipt locations and channels for vulnerable groups considering their constraints. ➢ Maintain logbooks. ➢ Establish clear timetables for resolving grievances. ➢ Assign each compliant a unique ID, track and report its resolution. ➢ Work with the complainant to find a resolution throughout the GRM. ➢ Keep complainant informed of resolution process. ➢ Seek feedback from the complainant to improve GRM functionality.	➢ Intimidate, threat, or harass complaints. ➢ Set unrealistic redress durations. ➢ Exclude vulnerable groups. ➢ Create constraints in filing grievances. ➢ Create barriers or compound the procedures for grievance filing receipt. ➢ Disclose aggrieved identity to others. ➢ Make false promises to the complainant. ➢ Be biased in redressal. ➢ Expect or seek any compensation or benefits from complainants.

11.4 The Project-affected People's Mechanism

The Project-affected People's Mechanism (PPM) has been established by AIIB to provide an opportunity for the independent and impartial review of submissions from Project-affected people who believe they have been or are likely to be adversely affected by the AIIB's failure to implement its ESP in situations when their concerns cannot be addressed satisfactorily through the Project-level GRM or the AIIB's management processes. Information about the PPM is available at: *https://www.aiib.org/en/policies-strategies/operational-policies/policy-on-the-project-affected-mechanism.html*

Chapter 13: Summary, recommendations and conclusion

The ESIA has assessed overall acceptability of environmental and social impacts likely to arise as a result of construction and operation of 132/33 kV (2X50 MVA) GIS at Titabor and 132/33 kV (2X50 MVA) AIS at Chabua under Phase II of AISTSEP project. The proposed subproject is categorized as category B as the social or environmental impacts are assessed as limited, few in number, site specific, largely reversible, and readily addressed through mitigation measures.

The ongoing construction activities will change the baseline conditions to some extent. Mitigation measures for potential impacts on Air, Water, Soil, Noise, Ecology, and Socio-economics have been specified through proper

- Follow up of best practice of public disclosure and grievance management.
- Planning and designing of GIS substation structure, site preparation and access routes for, material transport etc.
- Application of standards for Health and Safety for transformer erection and other equipment installation activities.
- Clearances and permits required for each sub activity

The ESMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopted for subproject activities taken up during construction and operation phases of the project. Regular inspection and monitoring of environmental and social aspects throughout these phases will enhance the effectiveness of the proposed mitigation measures.

APPENDICES

Appendix 1: Rapid Environment and Social Assessment Checklist for Establishment of New 132/33 kV (2 X 50 MVA) GIS Substation at Titabor

Date of Site Visit	31.05.2025
Location	Titabor, Jorhat, Assam
GPS Coordinates	26°36'58.79"N 94°15'02.20"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 site was observed during site visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected area was noticed within or adjacent to the proposed site. The nearest protected area Hollongapar Gibbon WLS is found at a distance of 8.43 km from proposed 132 kV Titabor GIS site.
3. Wetland/ Mangrove/ Estuarine		No	However, a stream is located approximately 550 meters from the proposed 132/33 kV GIS site at Titabor.
4. Special area for protecting biodiversity		No	No such special area was observed
B. Potential Environmental Impacts. Will the Project cause?			
1. Impairment on 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 subproject construction works/civil works?	Yes		Emissions from construction machineries and vehicles: Construction activities often involve the use of heavy machineries and vehicles such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter ($PM_{2.5}$ and PM_{10}), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to subproject construction works/civil works?	Yes		Various construction activities like drilling, cutting, hammering and concrete mixing can produce loud noise.
7. 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 faecal contamination. This can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhoea, typhoid, and hepatitis A.

Particulars	Yes	No	Remarks
8. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and other vectors of diseases?	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.
9. 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
10. 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
11. 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.
12. 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
13. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulphur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
14. 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 Chabua and Titabor Substations)	Yes, Land procurement required for both the Substations.
2. Landownership of the project area: Govt. / Private lands	The land for the proposed Titabor S/S was Private Tea Garden land.
3. Does the project require acquisition of land or transfer of Govt. land / structures?	As suitable government land was not available, the land for the proposed Titabor substation has been acquired by the Government of Assam on behalf of AEGCL.
4. If yes please mention the area of land, number of affected structures, Households.	For the proposed Titabor Substation, 9 Bighas of tea garden land was acquired by the Government of Assam. The land for the substation is free from any encumbrances, structures, or residential households.
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	The proposed land for Titabor substation was previously used for tea plantation purposes.
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No. In Titabor, the acquired land was a less productive section of the tea estate, ensuring no significant impact on agricultural activity.
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No, only minor impact on tea plantation areas, with crop and zirat compensation provided.
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, tea plantation was internally adjusted by Tea Estate owners to avoid impact on workers' livelihoods.
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)	Involuntary resettlement of people, in terms of physical and/or economic displacement, is not anticipated.
14. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No. For the proposed Titabor S/S, Government land was not available in the vicinity. To minimize impact, a less productive section of the private tea estate was selected, avoiding displacement and minimizing effects on tea cultivation
15. Will community facilities require relocation?	No
16. Social conflicts if workers from other regions or countries are hired?	EPC contractors will be encouraged to prioritize the engagement of local labor. However, if workers from other regions or countries are employed, there is a potential for social conflicts during construction activities. These issues largely depend on the local context, cultural dynamics, and the manner in which the workforce is managed. Potential social conflicts may include: • Job competition between local and non-local workers. • Disparities in wages and labor conditions. • Tensions arising from cultural or language differences. • Strain on local resources and services.
17. Large population influx during project construction and operation that causes increased burden on social infrastructure and	Only a limited number of skilled migrant workers may be involved temporarily during the construction phase, and their presence is not expected to place any significant burden on local infrastructure. Emphasis will be given to engaging local labor for

Particulars	Observation
services (such as water supply and sanitation systems)?	semi-skilled and unskilled work to promote community participation and employment
18. Social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing facilities and structures?	No. The substation construction will occur within uninhabited estate areas, ensuring no interference with local living conditions or structures.
19. Will a resettlement Action Plan be required?	In case of the proposed Titabor substation, located in Jorhat district, Resettlement Action Plan may not be required as the lands for substation was acquired by the Government of Assam from Letekujan Tea Estate (operated by M/s Kasojan Tea Company Pvt. Ltd.). The acquisition process was carried out under the Assam Land (Requisition and Acquisition) Act, 1964 to ensure timely implementation of the project. Compensation for land and Tea bushes including few numbers of shade trees provided by the District Authority to the tea garden authorities in accordance with the provisions of the *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013*, thereby ensuring transparency, fairness, and adequacy in the compensation process.
20. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
21. Livelihood- Direct impact due to loss of land and structures?	No.
22. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
23. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; however, any further risk will be minimized through standard safety norms.
24. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
25. 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
26. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
27. Which are the economic activities of IP will be affected by the proposed project development and how?	No Indigenous Peoples (IP) will be affected, as there is no presence of indigenous communities in the vicinity of either substation.
28. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No
29. 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 IP plan.
30. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	For the proposed Titabor S/S, Government land was not available in the vicinity. To minimize impact, a less productive section of the private tea estate was selected, avoiding displacement and minimizing effects on tea cultivation

Appendix 2: Rapid Environment and Social Assessment Checklist for Establishment of New 132/33 kV (2 X 50 MVA) AIS Substation at Chabua

Date of Site Visit	30.05.2025
Location	Chabua, Dibrugarh, Assam
GPS Coordinates	27°27'55.34"N 95°11'27.57"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 site was observed during site visit.
2. Legally protected Area (core zone or buffer zone)		No	No protected area was noticed
3. Wetland/ Mangrove/ Estuarine		No	However, Sesa Noi River is located approximately 281 meters from the proposed 132/33 kV AIS site at Chabua.
4. Special area for protecting biodiversity		No	No such special area was observed
B. Potential Environmental Impacts. Will the Project cause?			
1. Impairment on 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 subproject construction works/civil works?	Yes		Emissions from construction machineries and vehicles: Construction activities often involve the use of heavy machineries and vehicles such as excavators, bulldozers, and trucks. These machines typically run on diesel or gasoline, which emit pollutants such as nitrogen oxides (NOx), particulate matter ($PM_{2.5}$ and PM_{10}), and volatile organic compounds (VOCs) into the air.
6. Noise and vibration due to subproject construction works/civil works?	Yes		Various construction activities like drilling, cutting, hammering and concrete mixing can produce loud noise.
7. 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 faecal contamination. This can contaminate water sources, soil, and food, contributing to the spread of diseases like diarrhoea, typhoid, and hepatitis A.

Particulars	Yes	No	Remarks
8. Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and other vectors of diseases?	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.
9. 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
10. 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
11. 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.
12. 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
13. Use of chemicals?	Yes		• Concrete Admixtures • Anti-Corrosion Coatings • Insulating Oils • Sulphur Hexafluoride (SF6) • Fire Suppression Agents • Lubricants • Cleaning Agents
14. Generation of wastewater during construction or operation?	Yes		Both construction and operation of various facilities can generate wastewater

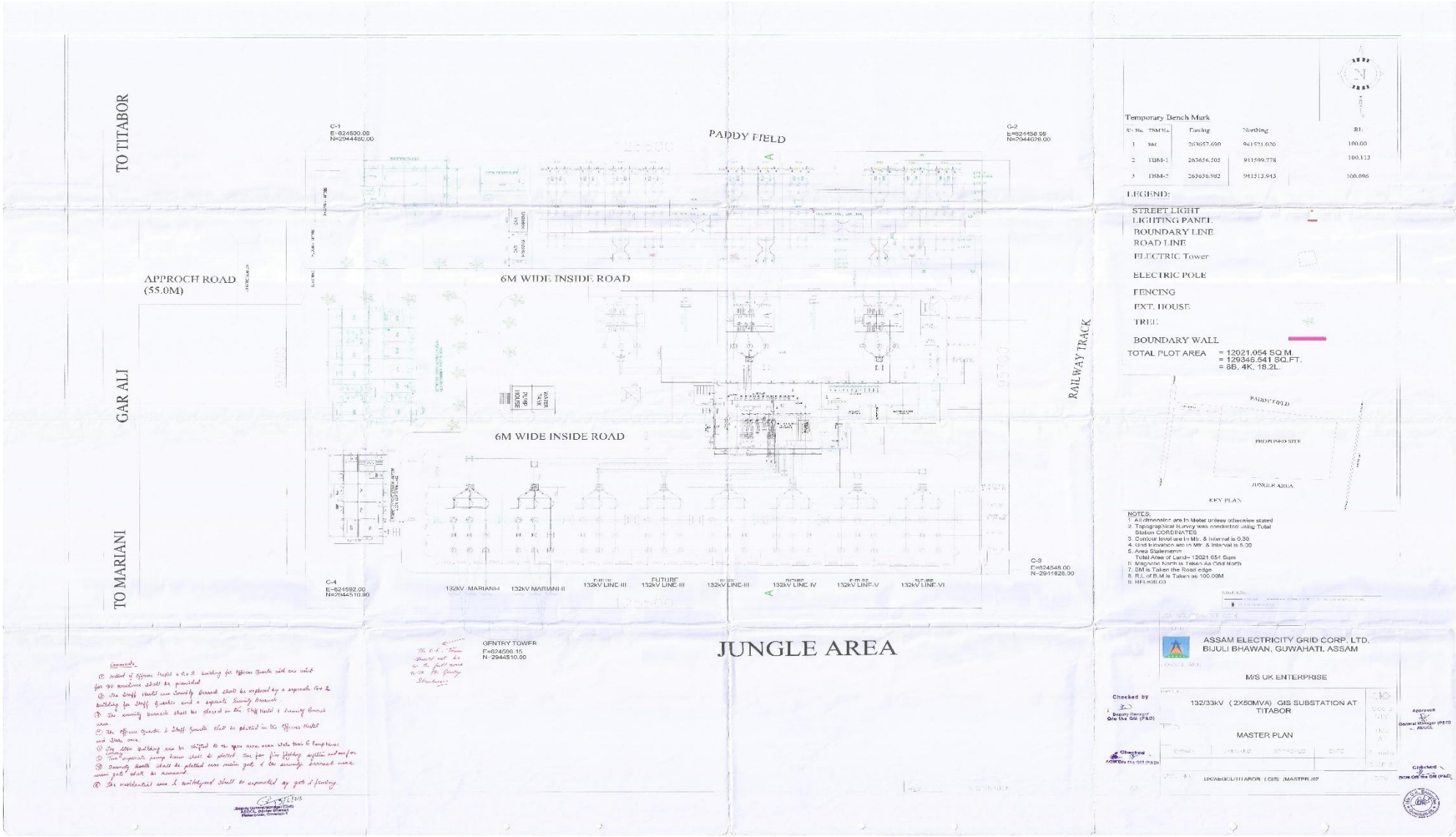
B. Social Screening Checklist

Particulars	Observation
A. Proposed Site Location	
1. Does Land procurement require for the project	Yes, Land procurement required for the Substation.
2. Landownership of the project area: Govt. / Private lands	The land for the proposed substation was Private Tea Garden land.
3. Does the project require acquisition of land or transfer of Govt. land/structures?	As suitable government land was not available, the land for the proposed substation has been acquired by the Government of Assam on behalf of AEGCL.
4. If yes please mention the area of land, number of affected structures, Households.	For the proposed Chabua Substation, 27 Bighas of private tea garden land, acquired by the Government of Assam. The land for substation is free from any encumbrances, structures, or residential households.
5. Present usage of the land parcels is for: Agricultural purposes, Residential purposes, Commercial purposes and other purposes (Indicate)	The proposed lands for the Chabua substation was previously used for tea plantation purposes.
6. Will the project lead to loss of housing?	No
7. Will the project lead to loss of agricultural land?	No. In Chabua, the tea cultivation on the acquired land was strategically shifted to an alternative area within the same estate, thereby avoiding any net loss of productive agricultural land.
8. Will the project cause damage to private property/assets? (structures, crops, trees, etc.)	No, only minor impact on tea plantation areas, with crop and zirat compensation provided.
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, tea plantation were internally adjusted by Tea Estate owners to avoid impact on workers' livelihoods.
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)	Involuntary resettlement of people, in terms of physical and/or economic displacement, is not anticipated.
14. Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	No. The project site was selected to avoid such impacts. Livelihoods of tea garden workers remain protected through internal adjustment of operations.
15. Will community facilities require relocation?	No
16. Social conflicts if workers from other regions or countries are hired?	EPC contractor will be encouraged to prioritize the engagement of local labor. However, if workers from other regions or countries are employed, there is a potential for social conflicts during construction activities. These issues largely depend on the local context, cultural dynamics, and the manner in which the workforce is managed. Potential social conflicts may include: • Job competition between local and non-local workers. • Disparities in wages and labor conditions. • Tensions arising from cultural or language differences.

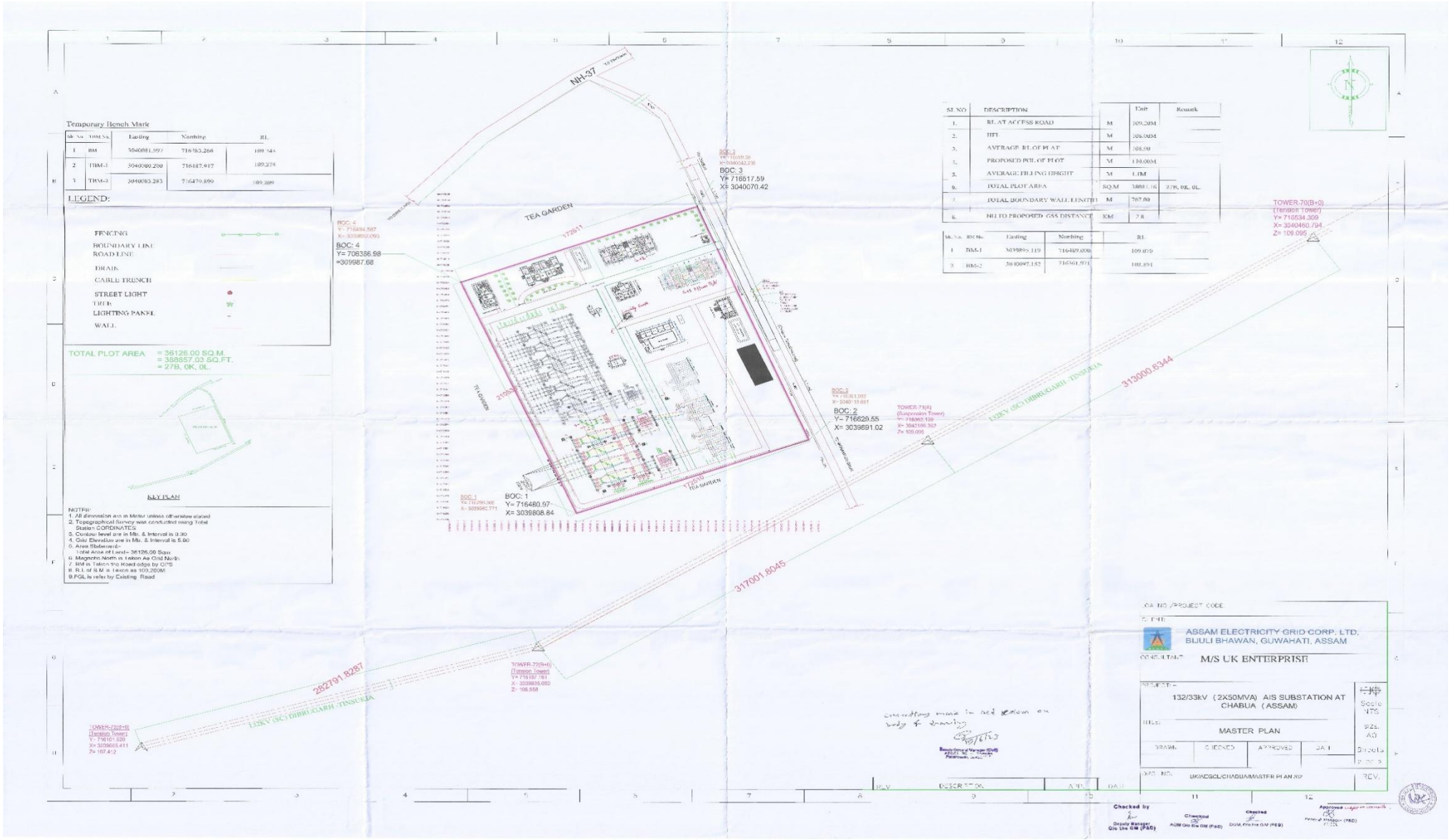
Particulars	Observation
	• Strain on local resources and services.
17. Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?	Only a limited number of skilled migrant workers may be involved temporarily during the construction phase, and their presence is not expected to place any significant burden on local infrastructure. Emphasis will be given to engaging local labor for semi-skilled and unskilled work to promote community participation and employment
18. Social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing facilities and structures?	No. The substation construction will occur within uninhabited estate areas, ensuring no interference with local living conditions or structures.
19. Will a resettlement Action Plan be required?	In the case of the proposed Chabua substation is located in Dibrugarh district. Resettlement Action Plan may not be required as the land for substation acquired by the Government of Assam from the Chabua Tea Estate (owned by Amalgamated Plantations Private Limited). The acquisition process was carried out under the Assam Land (Requisition and Acquisition) Act, 1964 to ensure timely implementation of the project. Compensation for land and Tea bushes including few numbers of shade trees was provided by the District Authority to the tea garden authority in accordance with the provisions of the *Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013*, thereby ensuring transparency, fairness, and adequacy in the compensation process.
20. Impact on local economy – Fisheries, local tourism related businesses, market places, etc.?	No
21. Livelihood- Direct impact due to loss of land and structures?	No.
22. Indirect impact due to loss of commercial grounds, market places, places for hawker stalls, etc.?	No loss of commercial land.
23. Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	Low risk; however, any further risk will be minimized through standard safety norms.
24. Other social concerns relating to inconveniences in living conditions in the project areas?	Not anticipated any such inconvenience
25. 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
26. Does the project related work affect any objects that are of religious and cultural significance to the IPs?	No
27. Which are the economic activities of IP will be affected by the proposed project development and how?	No Indigenous Peoples (IP) will be affected, as there is no presence of indigenous communities in the vicinity of the substation.
28. Is there a requirement for an in-depth Indigenous people's plan? (IPP)	No
29. 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 IP plan.

Particulars	Observation
30. Describe alternatives, if any, to avoid or minimize land acquisition/displacement of people from private or public lands	For the proposed Chabua S/S, no suitable government land was available. The selected site within the private tea estate allowed internal adjustment of tea cultivation, thereby avoiding displacement and ensuring no net loss of productive land.

Appendix 3 : Layout Plan for the Proposed 132/33kV GIS at Titabor



Appendix 4 : Layout Plan for the Proposed 132/33kV AIS at Chabua



Appendix 5 : Letter from Letekoojan Tea Garden Authority, Titabor

KASOJAN TEA COMPANY PRIVATE LIMITED

Telephone :
Jorhat – 0376 2304029, Fax : 0376 2300532
Assam

Registered Office :
Tarajan, P.O. Jorhat – 785001,

To
The Assistant General Manager,
T&T Division, AEGCL
Garmur, Jorhat.

Date: 24.07.25

Subject: Confirmation Regarding Land Transfer for 132/33 KV Substation at Letekoojan (Titabor)and No Impact on Labour Community.

Dear Sir,

This is to formally confirm the details regarding the parcel of land transferred by Letekoojan Tea Estate, operated by M/s Kasojan Tea Company Pvt. Ltd., to Assam Electricity Grid Corporation Limited (AEGCL) for the development of a 132/33 kV Gas Insulated Substation (GIS) at Titabor.

We would like to state the following:

1. The land measuring 1.20 hectares was transferred to AEGCL on 07.10.2021 through mutual negotiation, without invoking any compulsory acquisition process.
2. The said transfer did not affect any tea garden worker or staff, and no displacement or disruption to their employment or residence occurred as a result of this transaction.
3. That the land acquisition was undertaken to expedite the transfer process, and the amount received is being utilized by the estate for adjusting or developing other vacant grant areas within the garden to maintain operational continuity.
4. Letekujan Tea Estate has a total grant area of 303.61 hectares, with a current planted area of 229.80 hectares. The garden retains sufficient unutilized land to accommodate and manage 1.20 hectares area transferred for the substation, without affecting tea cultivation or estate operations.

We remain committed to supporting infrastructure development in the region and are pleased to have contributed to this important public utility project.

Please feel free to reach out for any further clarification or documentation required.

Thanking you,

Yours faithfully,

For Kasojan Tea Co. Pvt. Ltd.
A/c Letekoojan Tea Estate

Managing Director

KASOJAN TEA CO. PVT. LTD. TARAJAN, A. T. ROAD JORHAT - 785001 ASSAM

Appendix 6(A) : Land Acquisition details as per RFCTLARR Act, 2013 for 132/33KV, 2X50 MVA GIS at Titabor

[Sec rule 24]

Estimate of preliminarily cost of land acquisition under Act of 2013

Name of Requiring Body Assam Electricity Grid Corporation Limited requiring the land for construction of a new 132 KV Grid Sub-Station in village Karikatia Grant, P.S. Titabor, Mouza / Pargana Titabor, District Jorhat.

Part –I

(1)		Market value of land as provided under sub-section (1) of section 26			
	(a)	Description of land	Area of land in B-K-L	Rate per Kaiha	Amount
			9-0-0	Rs.1,00,360.00	Rs. 45,16,200.00
	(b)	Deduct Conversion premium of A.P. land, if any	NIL		
		Total			Rs. 45,16,200.00
(2)		Factor by which the market value is to be multiplied as provided under sub-section (2) of section 26, as notified by the State Govt.			1.5 times land value
(3)		Total of market value of land determined under sub-section (1) & (2) of section 26 [(1) x (2)]			Rs. 67,74,300.00
(4)		Value of assets attached to land or building as provided under section 29 Houses Trees ..... Wells/tanks Crops			Rs. 3,50,038.00
		Total of (3) + (4)-			Rs. 71,24,338.00
(5)		Solatium as provided under sub-section (1) of section 30@100% of (3)+(4)			Rs. 71,24,338.00
(6)		Addl. Compensation @ 12% per annum on the market value of land at Sl. (1) as provided under sub-section (3) of section 30			Rs. 5,41,944.00
(7)		Damages as provided under clause 2 to 6 of section 28 (if any)			
		Total Compensation [total of (3) + (4)+ (5)+ (6)+ (7)]			Rs. 1,47,90,620.00

Certified Copy –

Deputy General Manager
Upper Assam T & T Circle
AEGCL, Jorhat

Assistant Manager (A)
Upper Assam T & T Circle
AEGCL, Jorhat

B.F. ..... Rs. 1,47,90,620.00

Part-II

Add capitalized value of Govt. Revenue 25 years Land Revenue .....8440/- Rs. 8,437.50
(@ Rs. 337.60 per year)

Add Conversion premium of A.P. land ..... NIL

Part-III

Administrative Cost

Cost of establishment (@ 5%) ..... Rs. 7,39,531.00

Cost of contingencies (@ 1%) ..... Rs. 1,47,906.20

Grand total of part I, II. & III - Rs. 1,56,86,494.70

(in words) Rupees (One Crore Fifty Six Lakh Eighty Six Thousand Four Hundred Ninety Four and Seventy Paisa) only

Prepared by .....

Checked by .....

Certified that estimate is fair and that the rates have been arrived at after local enquiry, inspection o the ground and with reference to the records of the Registration Department.

Land acquisition Officer
Additional Deputy Commissioner(LA)
Jorhat

Collector
Deputy Commissioner
Jorhat

Countersigned by,

Divisional Commissioner

Certified Copy —

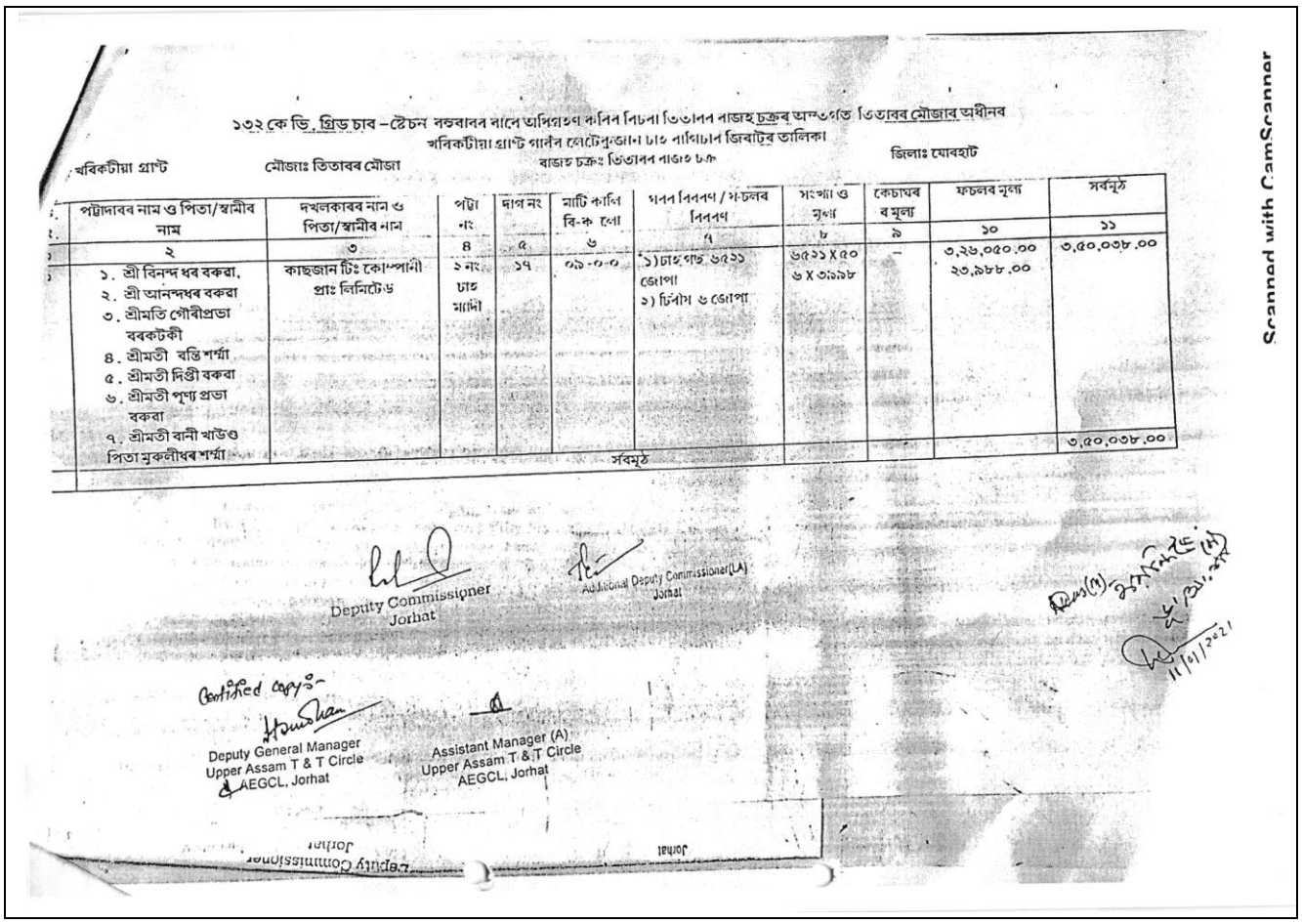
Deputy General Manager
Upper Assam T & T Circle
AEGCL, Jorhat

Assistant Manager (A)
Upper Assam T & T Circle
AEGCL, Jorhat

Countersigned by,

Secretary to the Govt. of Assam,
Revenue & Disaster Management Department

Sanctioned by,



১৩২ কে ভি, গ্রিড চাব –ষ্টেচন বন্তবাবব বাবে অধিগ্রহণ কবিব বিচনা তিতাবব বাজহ চক্রব অন্তর্গত তিতাবব মৌজাব অধীনব
খবিকটীয়া গ্রাণ্ট গাবঁব লোটেনুজান চাহ বাগিচাব জিবাটব তালিকা

খবিকটীয়া গ্রাণ্ট | মৌজাঃ তিতাবব মৌজা | বাজহ চক্রঃ তিতাবব বাজহ চক্র | জিলাঃ যোবহাট

পট্টাদাবব নাম ও পিতা/স্বামীব নাম	দখলকাবব নাম ও পিতা/স্বামীব নাম	পট্টা নং	দাগ নং	মাটি কাটি বি-ক লো	গবব বিবৰণ / ফলব বিবৰণ	সংখ্যা ও মূল্য	কেচাঘব মূল্য	ফচলব মূল্য	সর্বমূঠ
২	৩	৪	৫	৬	৭	৮	৯	১০	১১
১. শ্রী বিনন্দ ধব বকবা, ২. শ্রী আনন্দধব বকবা ৩. শ্রীমতি গৌবীপ্রভা বববকটকী ৪. শ্রীমতী বন্তি শর্ম্মা ৫. শ্রীমতী দিপ্তী বকবা ৬. শ্রীমতী পূণ্য প্রভা বকবা ৭. শ্রীমতী বানী খউও পিতা মুকলীধব শর্ম্মা	কাছজান টিঃ কোম্পানী প্রাঃ লিমিটেড	১ নং চাহ মাদী	১৭	০৯-০-০	১) চাহ গছ ৬৫২১ জোপা ২) চিবীস ৬ জোপা	৬৫২১ X ৫০ ৬ X ৩৯৯৮	–	৩,২৬,০৫০.০০ ২৩,৯৮৮.০০	৩,৫০,০৩৮.০০
					সর্বমূঠ				৩,৫০,০৩৮.০০

Deputy Commissioner
Jorhat

Additional Deputy Commissioner(LA)
Jorhat

Certified copy:-

Deputy General Manager
Upper Assam T & T Circle
AEGCL, Jorhat

Assistant Manager (A)
Upper Assam T & T Circle
AEGCL, Jorhat

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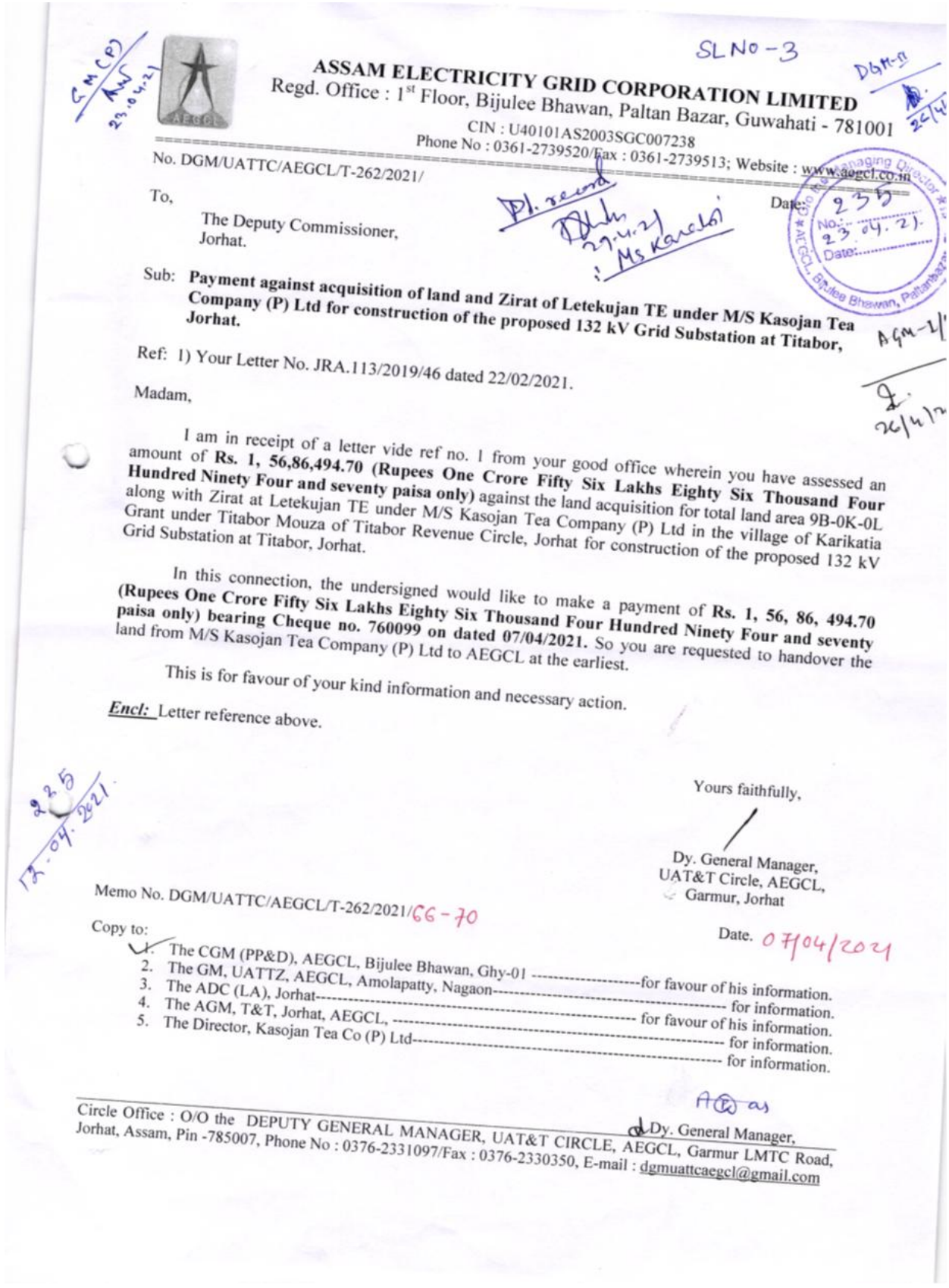
Appendix 7 (B) : Payment Disbursement Against Land compensation details for 132/33KV, 2X50 MVA GIS at Titabor



ASSAM ELECTRICITY GRID CORPORATION LIMITED
Regd. Office : 1st Floor, Bijulee Bhawan, Paltan Bazar, Guwahati - 781001
CIN : U40101AS2003SGC007238
Phone No : 0361-2739520/Fax : 0361-2739513; Website : www.aegcl.co.in

No. DGM/UATTC/AEGCL/T-262/2021/

Date: 23.04.21

To,

The Deputy Commissioner,
Jorhat.

Sub: **Payment against acquisition of land and Zirat of Letekujan TE under M/S Kasojan Tea Company (P) Ltd for construction of the proposed 132 kV Grid Substation at Titabor, Jorhat.**

Ref: 1) Your Letter No. JRA.113/2019/46 dated 22/02/2021.

Madam,

I am in receipt of a letter vide ref no. 1 from your good office wherein you have assessed an amount of **Rs. 1, 56,86,494.70 (Rupees One Crore Fifty Six Lakhs Eighty Six Thousand Four Hundred Ninety Four and seventy paisa only)** against the land acquisition for total land area 9B-0K-0L along with Zirat at Letekujan TE under M/S Kasojan Tea Company (P) Ltd in the village of Karikatia Grant under Titabor Mouza of Titabor Revenue Circle, Jorhat for construction of the proposed 132 kV Grid Substation at Titabor, Jorhat.

In this connection, the undersigned would like to make a payment of **Rs. 1, 56, 86, 494.70 (Rupees One Crore Fifty Six Lakhs Eighty Six Thousand Four Hundred Ninety Four and seventy paisa only) bearing Cheque no. 760099 on dated 07/04/2021.** So you are requested to handover the land from M/S Kasojan Tea Company (P) Ltd to AEGCL at the earliest.

This is for favour of your kind information and necessary action.

Encl: Letter reference above.

Yours faithfully,

Dy. General Manager,
UAT&T Circle, AEGCL,
Garmur, Jorhat

Memo No. DGM/UATTC/AEGCL/T-262/2021/66-70

Date. 07/04/2021

Copy to:

1. The CGM (PP&D), AEGCL, Bijulee Bhawan, Ghy-01 ----------for favour of his information.
2. The GM, UATTZ, AEGCL, Amolapatty, Nagaon---------- for information.
3. The ADC (LA), Jorhat---------- for favour of his information.
4. The AGM, T&T, Jorhat, AEGCL, ---------- for information.
5. The Director, Kasojan Tea Co (P) Ltd---------- for information.

Dy. General Manager,

Circle Office : O/O the DEPUTY GENERAL MANAGER, UAT&T CIRCLE, AEGCL, Garmur LMTC Road, Jorhat, Assam, Pin -785007, Phone No : 0376-2331097/Fax : 0376-2330350, E-mail : dgmuattcaegcl@gmail.com

Appendix 8 (C): Transfer of Land possession to AEGCL for 132/33KV, 2X50 MVA GIS at Titabor

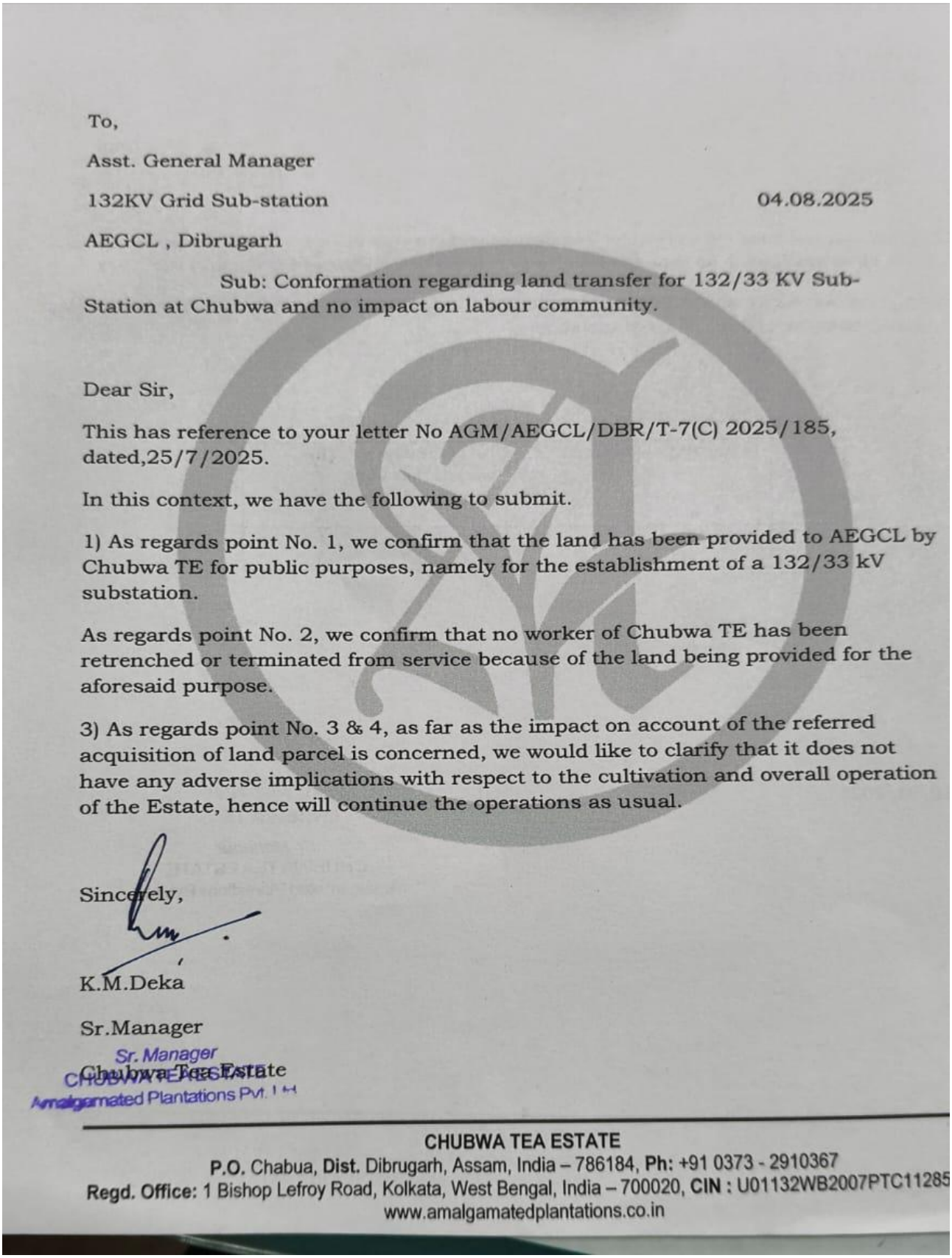
চাৰিসীমা নিৰ্ধাৰন কৰি সীমা চমজি লোৱাৰ সম্মতিপত্ৰ ঃ

এঃইঃজিঃচিঃএলঃ(AEGCL)-ৰ দ্বাৰা স্থাপন কৰিব লোৱা 132KV GIS-ৰ বাবে কাছজান টি কোম্পানী পাইভেট লিমিটেডৰ দখলত থকা তিতাবৰ মৌজাৰ খৰিকটীয়া গ্ৰাণ্ট ৰাজহ গাঁৱৰ ২ নং চাহ ম্যাদী পট্টাৰ ১৭ নং দাগৰ অংশ ০৯(ন) বিঘা জমি জিলা উপায়ুক্তৰ দ্বাৰা অধিগ্ৰহন কৰি আজি ইংৰাজী ~~২৯-০৯-২০২১~~ 07-10-2021 তাৰিখে উক্ত জমি লেটেকুজান চাহ বাগিছাৰ পৰিচালক গোষ্ঠীৰ উপস্থিতিত ও সাক্ষাতত জোখ মাপৰ অন্তত সীমা নির্ধাৰন কৰি আবেদনকাৰী তথা এঃইঃজিঃচিঃএলঃ(AEGCL)-বিষয়ববীয়াক দখল চমজায় দিয়াত এঃইঃজিঃচিঃএলঃ(AEGCL)-বিষয়ববীয়াই দখল চমজি লৈ কোনো আপত্তি নাই বুলি তলত স্বাক্ষৰ কৰি দিয়ে ।

দখল চমজি দিয়াসকলৰ

দখল চমজি পালো -
07/10/2021
Asst. Gen. Manager
T&T Div^n, AEGCL, Jorhat

Appendix 9 : Letter from Chubwa Tea Garden Authority, Chabua



To,

Asst. General Manager

132KV Grid Sub-station 04.08.2025

AEGCL , Dibrugarh

Sub: Conformation regarding land transfer for 132/33 KV Sub-Station at Chubwa and no impact on labour community.

Dear Sir,

This has reference to your letter No AGM/AEGCL/DBR/T-7(C) 2025/185, dated,25/7/2025.

In this context, we have the following to submit.

1) As regards point No. 1, we confirm that the land has been provided to AEGCL by Chubwa TE for public purposes, namely for the establishment of a 132/33 kV substation.

As regards point No. 2, we confirm that no worker of Chubwa TE has been retrenched or terminated from service because of the land being provided for the aforesaid purpose.

3) As regards point No. 3 & 4, as far as the impact on account of the referred acquisition of land parcel is concerned, we would like to clarify that it does not have any adverse implications with respect to the cultivation and overall operation of the Estate, hence will continue the operations as usual.

Sincerely,

K.M.Deka

Sr.Manager

Chubwa Tea Estate

Sr. Manager
CHUBWA TEA ESTATE
Amalgamated Plantations Pvt. Ltd.

CHUBWA TEA ESTATE
P.O. Chabua, Dist. Dibrugarh, Assam, India – 786184, Ph: +91 0373 - 2910367
Regd. Office: 1 Bishop Lefroy Road, Kolkata, West Bengal, India – 700020, CIN : U01132WB2007PTC11285
www.amalgamatedplantations.co.in

ASSAM ELECTRICITY GRID CORPORATION LIMITED
Division Office: O/o. The Assistant General Manager,
132KV Grid Sub Station, Niz. Kadamoni, Dibrugarh-786001, Assam.
Email: agm.dibrugarh@aegcl.co.in , Phone: 0373-2322020.

No:AGM/AEGCL/DBR/T-7(C)/2025/ 185 Date: 25/07/25

To
The Senior Manager
Chabua Tea Estate
Amalgamated Plantations Pvt. Ltd.
Chabua, Dibrugarh District
Assam.

Subject: Confirmation Regarding Land Transfer for 132/33 kV Substation at Chabua and No Impact on Labour Community.

Dear Sir,

This is to kindly request your written confirmation on the following points concerning the parcel of land transferred to Assam Electricity Grid Corporation Limited (AEGCL) for the construction of a 132/33 kV Air Insulated Substation (AIS) at Chabua:

1. That the land measuring 3.62 hectares was transferred to AEGCL on 17.10.2022 through mutual negotiation, without invoking any form of compulsory acquisition.
2. That the said transfer does not affect any tea garden worker or staff, and no displacement or disruption to their existing work or residential arrangements has occurred as a result of this transaction.
3. That the land acquisition was undertaken to expedite the transfer process, and the amount received is being utilized by the estate for adjusting or developing other vacant grant areas within the garden to maintain operational continuity.
4. That the total grant area of Chabua Tea Estate is 1307.76 hectares, with a current planted area of 760.42 hectares, and the garden has sufficient unutilized land to absorb and adjust for the 3.62 hectares transferred for the substation, without affecting ongoing tea operations.

Your written confirmation on the above points will assist us in maintaining accurate records and ensuring transparency for future reference and compliance.

We appreciate your cooperation and support in this matter. Kindly provide your response at the earliest convenience.

Thanking you,

Yours sincerely,

Assistant General Manager
132 kV Grid Sub-Station,
AEGCL, Dibrugarh

Appendix 10(A) : Land Acquisition details as per RFCTLARR Act, 2013 for 132/33KV, 2X50 MVA AIS at Chabua

L.A. Case No. DRA 1/2020

Form-VII
[See rule 24]

Estimate of preliminary cost of land acquisition under Act 30 of 2013

Name of Requiring Body : Assam Electricity Grid Corporation Limited requiring the land measuring 27B – 0K – 00Ls in village : Chabua Tea Estate No. 44/151 ORR Grant, Mouza/Pargana : Pulonga, District : Dibrugarh for construction of 132 KV, 2X50 MVA Sub - Station at Chabua Tea Estate in the District Dibrugarh, Assam.

Part-I

(1)		Market value of land as provided under sub-section (1) of sec. 26	Rs. 3,50,000.00 (Rupees : Three lakhs fifty thousand) only		
	(a)	Description of land	Area of land in B – K – L	Rate per Bigha	Amount
		Village – Chabua Tea Estate No. 44/151 ORR Grant under Pulonga Mouza, District - Dibrugarh. Part of Dag No. – 40, 52 & 54 Patta No. 44/151 No. ORR Grant	27B – 0K – 00L	Rs. 3,50,000.00	Rs. 94,50,000.00
	(b)	Deduct Conversion premium of A.P. land, if any	NIL		
		Total	Rs. 94,50,000.00		
(2)		Factor by which the market value is to be multiplied as provided under sub-section (2) of section 26, as notified by the State Govt.	1.5		
(3)		Total of market value of land determined under sub-section (1) & (2) of section 26 [(1) x (2)]	Rs. 1,41,75,000.00		
(4)		Value of assets attached to land or buildings as provided under section 29 : Houses, Trees, Wells/tanks, Crops etc.	Rs. 21,29,732.00		
		Total of (3) + (4)	Rs. 1,63,04,732.00		
(5)		Solatium as provided under sub - section (1) of section 30 @ 100% of (3)+(4)	Rs. 1,63,04,732.00		
(6)		Addl. Compensation @ 12% per annum on the total market value at SL (3) as provided under sub-section (3) of section 30	Rs. 11,34,000.00		
(7)		Damages as provided under clause 2 to 6 of section 28 (if any)	NIL		
		Total Compensation [Total of (3)+(4)+(5)+(6)+(7)]	**Rs. 3,37,43,464.00**		

Part-II

Add capitalized value of Govt. Revenue : Rs 37.50 for 25 Years = Rs. 937.50

Add Conversion premium of A.P. land : NIL

Part III

Administrative cost

Cost of establishment	@ 5 %	:	Rs 16,87,173.20
Cost of contingencies	@ 1 %	:	Rs. 3,37,434.64
Total		:	**Rs. 20,24,607.84**

Grand total of part I, II & III : (Rs. 3,37,43,464.00 + Rs. 937.50 + Rs. 20,24,607.84)
= **Rs. 3,57,69,009.34**
Or, **(Say) Rs. 3,57,69,009.00**

Rupees (In words) : Three crores fifty seven lakhs sixty nine thousand & nine only.

Prepared by : Chandan Kr. Das (SA)

Checked by : Shankar Sen (Mandal)

Certified that estimate is fair and that the rates have been arrived at after local enquiry, inspection of the ground and with reference to the records of the Registration Department.

Land Acquisition Officer
Land Acquisition officer
Dibrugarh

Collector
Dibrugarh District
Dibrugarh

Addl. Deputy Commissioner (LA)
Addl. Deputy Commissioner
Dibrugarh

Countersigned by

Secretary to the Govt. of Assam
Revenue & D.M. Department

Sanctioned by

Secretary to the Govt. of Assam
..... Department

অধিগ্রহণৰ বাবে প্রস্তাৱিত মাটিত থকা ফচল/সা-সম্পত্তি গণনাৰ যুটীয়া প্রতিবেদন

তাৰিখ ঃ ০৬/০২/২০২০

মৌজা ঃ চুলুঙা গাঁও ঃ চাবুৱা চাহ বাগিচা ৪৪৫৫৯ মাটিৰ কালি ঃ ২৭ বিঘা

দাগ নং ঃ ২০ অং, ০৫ অং, ০২ অং পট্টা নং ঃ ৪৫ ৮৫১ সং চা, আৰ, আৰ, আই গোচৰ নং ঃ

মাটিত থকা ঘৰ ফছলৰ তালিকা

পট্টাদাৰ/দখলদাৰৰ নাম ঃ চাবুৱা টি ষ্টেট

ক্রমিক নং	ঘৰ আৰু ফছলৰ নাম	ডাঙৰ	মধ্যম	সৰু	পুলি
১।	চাহ গছ (৫ বছৰ ওপৰৰ) ২৬১১০ গোছ আঁতৰমা ১৪৪০ জোপা	৬৪,৪৯৬	—	—	—
২।	শিৰিষ - - - - - - - - - -	৬৬	৬২	১১	৮
৩।	তাঁৰৰ ফেঁকিং, গৰী পুটা, ৬ ফুট উচ্চতা = ১১৮ মিটাৰ				

Land Acquisition Officer
Dibrugarh

Addl. Deputy Commissioner
Dibrugarh

পট্টাদাৰৰ চহী/ SENIOR MANAGER দখলকাৰৰ চহী
Chubwa Tea Estate

Circle Officer
Chabua
Chief Revenue Circle
Chabua

ASSISTANT ENGINEER
132 KV BIHIATING GSS
AEGCL, DIBRUGARH

ভূঃ অঃ প্রাঃ চহী

Appendix 11(B) : Transfer of compensation amount to Chabua T.E. (Amalgated plantation Limited)

GOVERNMENT OF ASSAM
OFFICE OF THE DISTRICT COMMISSIONER :: DIBRUGARH DISTRICT
DIBRUGARH

No DRA.1/2020/227
To

Dated Dibrugarh the 29/09/2023.

The Branch Manager,
Indian Bank,
Dibrugarh Branch,

Subject: Regarding transfer of fund through RTGS.

Sir,

With reference to the above, I would like to request you to transfer the following amount in favour of the under mentioned beneficiary as shown against the name from the Account of "DEPUTY COMMISSIONER DIBURGARH, AEGCL-SS", bearing Account No. 7383009697 lying in your bank through RTGS with intimation to the undersigned.

Sl. No.	Name of the Beneficiary	Amount to be transferred	Account No. & Bank Name	IFS Code
1	Chubwa Tea Estate Amalgamated Plantations private Limited	46,62,840.00	915020029554381 Axis Bank Dibrugarh Branch	UTIB0000597
2	Chubwa Tea Estate Amalgamated Plantations private Limited	5,46,000.00	915020029554381 Axis Bank Dibrugarh Branch	UTIB0000597
3	Chubwa Tea Estate Amalgamated Plantations private Limited	2,42,75,160.00	915020029554381 Axis Bank Dibrugarh Branch	UTIB0000597
4	Chubwa Tea Estate Amalgamated Plantations private Limited	42,59,464.00	915020029554381 Axis Bank Dibrugarh Branch	UTIB0000597

Yours Faithfully,

Addl. District Commissioner (GAZ.)
Dibrugarh

INDIAN BANK R.N.C. PATH, DIBRUGARH 786001

Appendix 12(C) : Letter From Addl, District Commissioner (L.A) Dibrugarh to the Circle Officer, Chabua Revenue Circle for Mutation of Land record.

document-515.pdf file:///C:/Users/HP/Downloads/document-515.1

LA/1394/2023-LA-DBR

I/194670/2024

GOVERNMENT OF ASSAM
OFFICE OF THE DISTRICT COMMISSIONER ::: DIBRUGARH
(LAND ACQUISITION BRANCH)

No. LA/1394/2023-LA-DBR/D-3 Dated Dibrugarh 06/05/2024

To,

The Circle Officer,
Chabua Revenue Circle.

Sub. : Regarding mutation of acquired land for construction of 132KV,2X50 MVA Grid Substation at Chabua tea estate.

Sir,

With reference to the above, I am to inform you that land measuring 27bigha was acquired for construction of AEGCL's 132kV, 2x50 MVA Grid Sub-Station, at Chabua Tea Estate.

In this regard, I am to forward herewith letter No-AEGCL/DGM/TTC/DBR/T-47/2024/103 dated 03.05.2024 received from Deputy General Manager, Dibrugarh T & T Circle, AEGCL, Dibrugarh regarding mutation of land records of the said acquired land and request you to take steps to mutate the same in the name of requiring department.

Yours faithfully,

Signed by
Dr. Monika Borah
Addl. District Commissioner (L.A)
Date: 06-05-2024 11:23:31
Dibrugarh.

Memo No. LA/1394/2023-LA-DBR/D-3 -A- Dated Dibrugarh 06/05/2024.

Copy to:-

1. Deputy General Manager, Dibrugarh T & T Circle, AEGCL, Dibrugarh for information and necessary action.
2. PA to District Commissioner, Dibrugarh for kind appraisal of District Commissioner, Dibrugarh.

e-signed
Addl. District Commissioner (L.A)
Dibrugarh.

Appendix 13 : Environmental and Social Exclusion List as per AIIB ESF, 2024

Environmental and Social Exclusion List

The Bank will not knowingly finance Projects involving the following:

1. Forced labor[i] or harmful or exploitative forms of child labor.[ii]
2. The production of, or trade in, any product or activity deemed illegal under national laws or regulations of the Member in whose territory the Project is located, or international conventions and agreements, or subject to international phase out or bans, such as:
   - 2.1. Production of, or trade in, products containing polychlorinated biphenyl (PCBs).[iii]
   - 2.2. Production of, or trade in, pharmaceuticals, pesticides/herbicides and other hazardous substances subject to international phase outs or bans (Rotterdam Convention, Stockholm Convention).[iv]
   - 2.3. Production of, or trade in, ozone depleting substances subject to international phase out (Montreal Protocol).[v]
3. Trade in wildlife or production of, or trade in, wildlife products regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).[vi]
4. Transboundary movements of waste prohibited under international law (Basel Convention).[vii]

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[i] Forced labor means any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty (including any kind of forced or compulsory labor, such as indentured labor, bonded labor or similar labor-contracting arrangements, or labor by trafficked persons).

[ii] For purposes of this List, harmful or exploitative forms of child labor means the employment of children under the age of 18 for work which by its nature or the circumstances in which it is carried out is likely to jeopardize their health, safety or morals. However, if the laws or regulations of the country in which the Project is located provide, in conformity with the International Labour Organization's Minimum Age Convention, 1973, that children at least 16 years of age may be employed for such work on condition that their health, safety and morals are fully protected and that they have received adequate specific instruction or vocational training in the relevant branch of activity, then child labor means employment of children for work that does not comply with these laws and regulations.

[iii] PCBs: Polychlorinated biphenyls are a group of highly toxic chemicals. PCBs are likely to be found in oil-filled electrical transformers, capacitors and switchgear dating from 1950 to 1985.

[iv] United Nations Consolidated List of Products whose Consumption and/or Sale have been Banned, Withdrawn, Severely Restricted or not Approved by Governments; Convention on the Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention); Stockholm Convention on Persistent Organic Pollutants; World Health Organization Recommended Classification of Pesticides by Hazard. A list of pharmaceutical products subject to phase outs or bans is available at https://www.who.int/medicines/areas/quality_safety/safety_efficacy/pharm_restrictions/en/. A list of pesticides, herbicides and other hazardous substances subject to phase outs or bans is available at http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals/tabid/1132/language/en-US/Default.aspx

[v] Ozone Depleting Substances (ODSs): Chemical compounds which react with and deplete stratospheric ozone, resulting in the widely publicized "ozone holes." The Montreal Protocol on Substances that Deplete the Ozone Layer lists ODSs and their target reduction and phase out dates. A list of the chemical compounds regulated by the Montreal Protocol, which includes aerosols, refrigerants, foam blowing agents, solvents and fire protection agents, together with details of signatory countries and phase out target dates, is available from the United Nations Environment Programme, https://ozone.unep.org/treaties/montreal-protocol

[vi] The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). A list of CITES listed species is available from the CITES secretariat, https://www.cites.org/eng/disc/species.php

[vii] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, see http://www.basel.int

5. Production of, or trade in, weapons and munitions, including paramilitary materials.
6. Production of, or trade in, alcoholic beverages, excluding beer and wine.[viii]
7. Production of, or trade in, tobacco.[ix]
8. Gambling, casinos and equivalent enterprises.[x]
9. Production of, trade in, or use of asbestos fibers, whether or not bonded.[xi]
10. Activities prohibited by legislation of the Member in whose territory the Project is located or by international conventions relating to the protection of biodiversity resources or cultural resources, such as, Bonn Convention, Ramsar Convention, World Heritage Convention and Convention on Biological Diversity.[xii]
11. Commercial logging operations or the purchase of logging equipment for use in primary tropical moist forests or old-growth forests.
12. Production or trade in wood or other forestry products other than from sustainably managed forests.
13. Marine and coastal fishing practices, such as large-scale pelagic drift net fishing and fine mesh net fishing, harmful to vulnerable and protected species in large numbers and damaging to marine biodiversity and habitats.
14. Shipment of oil or other hazardous substances in tankers that do not comply with IMO requirements (IMO, MARPOL, SOLAS and Paris MOU).[xiii]
15. Thermal coal mining, coal-fired power and heating plants or Projects that are functionally related to coal.[xiv]

[viii] This does not apply to Clients who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to the entity's primary operations.
[ix] This does not apply to Clients who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to the entity's primary operations.
[x] This does not apply to Clients who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to the entity's primary operations.
[xi] In special circumstances, if necessary to enable a Client to transition from the use of bonded asbestos to alternative materials, the Bank may agree with the Client on a reasonable transition period, provided that the asbestos content of the materials being used is less than 20 percent. Projects involving disposal of asbestos are not prohibited, provided a suitable asbestos management plan is adopted for such disposal.
[xii] Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) - https://www.cms.int/; Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar Convention) - https://www.ramsar.org/; Convention Concerning the Protection of the World Cultural and Natural Heritage - https://whc.unesco.org/en/convention/; Convention on Biological Diversity - https://www.cbd.int/
[xiii] Noncompliance with International Maritime Organisation (IMO) requirements: tankers that do not have all required International Convention for the Prevention of Pollution from Ships (MARPOL) or International Convention for the Safety of Life at Sea (SOLAS) certificates (including, without limitation, International Safety Management Code compliance), tankers banned by the Paris Memorandum of Understanding on Port State Control (Paris MOU), and tankers due for phase out under MARPOL regulation 13G. No single hull tanker over 25 years old should be used. http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx
[xiv] Projects functionally related to coal means associated facilities that are dedicated to enable the mining and use of coal or projects that would not be carried out without dedicated coal-based power supply. In order to assist Clients to reduce their coal use, the Bank may support Projects that aim at early retirement of coal plants, replacement of coal with lower-carbon fuel sources, or Projects for decommissioning, remediation, and redevelopment of affected coal facility sites and communities.

Appendix 14 : Ambient Air Quality Test Reports

গ্ৰীনটেক্ এনভাইৰনমেন্টল ইঞ্জিনিয়াৰ এণ্ড কন্সালটেন্টছ
GREEN TECH ENVIRONMENTAL ENGINEER AND CONSULTANTS
(A Unit of XEUJ ABHIJANTRIK LLP)
House No-11, Champaknagar, Narayan Path, Bhetapara, Guwahati-781028, www.greentecheec.in
Mobile: 9435046677, 9954089052, E-mail: green_pranjal@hotmail.com, info@greentecheec.in
TC-15242

Format No.: GEEC/FM/48

TEST REPORT

ULR Number: TC152422500000924F					
Test Report No.:	GEEC/FL/22/2025/06/01		Date:	05/06/2025	
Customer Name	BRC-STELMEC (JV)		Lab. ID No.:	GEEC/AA/2025/06/01	
Address:	Station Rd, Duliajan, Bordubi No.1, Assam 786602		Name of the Project:	Construction of 132/33KV, 2X50 MVA GIS at Titabor and 132/33KV, 2x50MVA AIS at Chabua along with associated Transmission Lines (PKG:P-II-B)	
Sampling Location:	Project Site N 26°36'58" E 94°15'02" TITABOR AEGCL GRID		Date of Sampling:	02/06/2025 to 03/06/2025	
Ambient Temperature:	Max.	Min.	Humidity in %	Max	Min
	31.0°C	24.0°C		97	68
Wind Speed in Kmph:	Max	Min	Wind Direction	12 Hrs	18 Hrs
	12	0		SSW	S
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle		Date of Sample Receipt:	04/06/2025	
Monitored By:	Mr.Dilip Kr. Deka		Test Start Date:	04/06/2025	
Equipments Details:	ADS 01 RDS 01		Test End Date:	05/06/2025	

AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM_{10})	$\mu g/m^3$	42	100	IS 5182(23)
2	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	25	60	IS 5182(24)

Remark: .The parameters tested on the specific date are found to be within the NATIONAL AMBIENT AIR QUALITY STANDARDS, CPCB NOTIFICATION DATED 18TH NOVEMBER, 2009

Checked by:
Dr. Belinda Lahon
Quality Manager

Reviewed by:
Pranjal Buragohain
Authorised Signatory

* The results relate only to the item tested.
* The test report shall not be reproduced except in full, without written approval of the laboratory.
* The test report cannot be used as an evidence in a court of law without prior written approval of the laboratory.

********** End of Report**********

Page1 of 1

গ্রীনটেক্ এনভাইৰনমেন্টল ইঞ্জিনিয়াৰ এণ্ড কন্সালটেন্টছ
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House No-11, Champaknagar, Narayan Path, Bhetapara, Guwahati-781028, www.greentecheec.in
Mobile: 9435046677, 9954089052, E-mail: green_pranjal@hotmail.com, info@greentecheec.in
TC-15242

Format No.: GEEC/FM/48

TEST REPORT

ULR Number: TC152422500000915F					
Test Report No.:	GEEC/FL/22/2025/05/40		Date:	05/06/2025	
Customer Name	BRC-STELMEC (JV)		Lab. ID No.:	GEEC/AA/2025/05/40	
Address:	Station Rd, Duliajan, Bordubi No.1, Assam 786602		Name of the Project:	Construction of 132/33KV, 2X50 MVA GIS at Titabor and 132/33KV, 2x50MVA AIS at Chabua along with associated Transmission Lines (PKG:P-II-B)	
Sampling Location:	132/33 kV, 2x50 MVA AIS at Chabua N 27°27'58" E 95°11'23"		Date of Sampling:	30/05/2025 to 31/05/2025	
Ambient Temperature:	Max.	Min.	Humidity in %	Max	Min
	32.0°C	25.0°C		98	71
Wind Speed in Kmph:	Max	Min	Wind Direction	12 Hrs	18 Hrs
	15	1		SSW	S
Sampling Condition:	In GF/A, PTFE Filter Paper & Plastic Bottle		Date of Sample Receipt:	02/06/2025	
Monitored By:	Mr.Dilip Kr. Deka		Test Start Date:	02/06/2025	
Equipments Details:	ADS 01 RDS 01		Test End Date:	03/06/2025	

AMBIENT AIR QUALITY

Sampling and Analysis carried out as per GEEC/SOP/01

Sl. No.	Parameters	Unit	Results	Limits	Test Method
1	Particulate Matter (PM_{10})	$\mu g/m^3$	46	100	IS 5182(23)
2	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	24	60	IS 5182(24)

Remark: .The parameters tested on the specific date are found to be within the NATIONAL AMBIENT AIR QUALITY STANDARDS, CPCB NOTIFICATION DATED 18TH NOVEMBER, 2009

Checked by:
Dr. Belinda Lahon
Quality Manager

Reviewed by:
Pranjal Buragohain
Authorised Signatory

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********** End of Report**********

Page1 of 1

Appendix 15 : Ambient Noise Quality Test Reports

গ্রীনটেক্ এনভাইৰনমেন্টল ইঞ্জিনিয়াৰ এণ্ড কন্সালটেন্টছ
GREEN TECH ENVIRONMENTAL ENGINEER AND CONSULTANTS
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House No-11, Champaknagar, Narayan Path, Bhetapara, Guwahati-781028, www.greentecheec.in
Mobile: 9435046677, 9954089052, E-mail: green_pranjal@hotmail.com, info@greentecheec.in

TC-15242

TEST REPORT

Format No:GEEC/FM/47A

ULR Number: TC152422500000925F			
Report No:GEEC/FL/22/NLM/2025/06/01		Date:	05/06/2025
Name of the Industry	BRC-STELMEC (JV)	Lab Id.:	GEEC/NLM/2025/06/01
Address	Station Rd, Duliajan, Bordubi No.1, Assam 786602	Name of the Projcet:	Construction of 132/33KV, 2X50 MVA GIS at Titabor and 132/33KV, 2x50MVA AIS at Chabua along with associated Transmission Lines (PKG:P-II-B)
Noise Level Report			
Monitoring Location:	Project Site N 26°37'0.2" E 94°15'01" TITABOR AEGCL GRID	Date of Monitoring:	03/06/2025
Weather/Wind:	Cloudy sky, intermittent rain	Sound Level Meter	SL 4033 SD
Monitored By:	Mr. Dilip Kr. Deka	Sl.No.	Q699158

Measurement Results (Day Time)

Sl. No.	Parameters	Unit	Results	Method	CPCB Limit as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Leq (dBA)
1	Leq	dB(A)	58.9	Ambient Noise GEEC/SOP/AN/01 Issue date 27/05/2017	CPCB Limit for Commercial Area: Day Time Leq < 65 Night time Leq < 55
2	Lmin	dB(A)	45.6		
3	Lmax	dB(A)	67.8		

Remark: The parameters tested on the specific date are found to be within the CPCB Limit for Commrcial Area

Checked by
Dr. Belinda Lahon
Quality Manager

Reviewed by:
Pranjal Buragohain
Authorised Signatory

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The test report shall not be reproduced except in full, without written approval of the laboratory .
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গ্রীনটেক্ এনভাইৰনমেন্টল ইঞ্জিনিয়াৰ এণ্ড কন্সালটেন্টছ
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Mobile: 9435046677, 9954089052, E-mail: green_pranjal@hotmail.com, info@greentecheec.in

TC-15242

TEST REPORT

Format No:GEEC/FM/47A

ULR Number: TC152422500000916F			
Report No:GEEC/FL/22/NLM/2025/05/41		Date:	05/06/2025
Name of the Industry	BRC-STELMEC (JV)	Lab Id.:	GEEC/NLM/2025/05/41
Address	Station Rd, Duliajan, Bordubi No.1, Assam 786602	Name of the Projcet:	Construction of 132/33KV, 2X50 MVA GIS at Titabor and 132/33KV, 2x50MVA AIS at Chabua along with associated Transmission Lines (PKG:P-II-B)
Noise Level Report			
Monitoring Location:	Project Site at Chabua N 27°27'57" E 95°11'25"	Date of Monitoring:	31/05/2025
Weather/Wind:	Cloudy sky, intermittent rain	Sound Level Meter	SL 4033 SD
Monitored By:	Mr. Dilip Kr. Deka	Sl.No.	Q699158

Measurement Results (Day Time)

Sl. No.	Parameters	Unit	Results	Method	CPCB Limit as per THE NOISE POLLUTION (REGULATION AND CONTROL) RULES, 2000 Leq (dBA)
1	Leq	dB(A)	54.9	Ambient Noise GEEC/SOP/AN/01 Issue date 27/05/2017	CPCB Limit for Commercial Area: Day Time Leq < 65 Night time Leq < 55
2	Lmin	dB(A)	44.3		
3	Lmax	dB(A)	64.5		

Remark: The parameters tested on the specific date are found to be within the CPCB Limit for Commrcial Area

Checked by
Dr. Belinda Lahon
Quality Manager

Reviewed by:
Pranjal Buragohain
Authorised Signatory

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Appendix 16 : Standard Operating Procedure (SOP): Handling of Municipal Solid Waste and Hazardous Waste, Including Spill Response

1. Purpose

To ensure safe and environmentally sound handling, storage, and disposal of Municipal Solid Waste (MSW) and Hazardous Waste (HW) generated during the operation of substations in compliance with relevant environmental regulations, and to establish an effective emergency spill response mechanism.

2. Scope

This SOP applies to all operational staff of substations (both AIS and GIS) involved in handling solid and hazardous waste, including housekeeping and maintenance personnel.

3. Responsibilities

Role	Responsibilities
Substation In-Charge	Overall supervision of waste management and compliance with applicable regulations.
EHS Officer / Designated Staff	Daily implementation, monitoring, training, reporting, and emergency response.
Housekeeping Personnel	Proper segregation, collection, and storage of MSW.
Technical Staff	Safe handling, labelling, and temporary storage of hazardous waste.

4. Waste Classification and Segregation

A. Municipal Solid Waste (MSW) Categories

Type	Bin Colour	Examples
Biodegradable	Green	Food waste, garden waste, paper
Recyclable	Blue/White	Plastics, metals, packaging materials
Inert Waste	Black or labelled bin	Ash, dust, broken glass
Non-recyclable contaminated MSW	Red/Yellow	Soiled cloth, oily PPE, tissue, sanitary items

B. Hazardous Waste in Substations

Waste Type	Source	Handling/Storage
Used transformer oil	Transformer maintenance	Store in labelled leak-proof barrels with secondary containment
Contaminated oil rags and filters	Maintenance activities	Collect in red-lidded bins; treat as hazardous
Lead-acid batteries	DG sets, backup systems	Store in cool, ventilated area; send to CPCB-authorized recyclers
Used containers of paints, lubricants	Civil/electrical maintenance	Triple rinse or return to suppliers if allowed
SF_6 gas leakage	GIS Substations	Leak detection monitoring; cylinder refilling by licensed vendor
E-waste	Relays, panels, switches	Segregate and send to registered e-waste recyclers

5. Collection and Storage

A. MSW Collection

- Waste collected daily using labelled containers.
- Avoid open dumping or littering within premises.
- Storage bins must be closed, non-leaking, and cleaned regularly.

B. Hazardous Waste Storage

- Use impervious floors and secondary containment trays.
- Maintain hazard labels (e.g., flammable, toxic) on all containers.
- Keep Material Safety Data Sheets (MSDS) at the storage location.
- Maintain a register for quantity, date of generation, and disposal.

6. Transportation and Disposal

A. MSW

- Hand over segregated MSW to local municipal authority.
- Keep receipts for verification and reporting.

B. Hazardous Waste

- Store temporarily for up to 90 days.
- Dispose of via CPCB/SPCB authorized handlers only.
- Used oil must be sent to registered re-refiners or recyclers.
- Batteries should be returned to dealer or manufacturer.

7. Emergency Spill Response

In Case of Spills (e.g., oil, SF_6, battery acid):

i. Alert nearby personnel and evacuate if needed.
ii. Don PPE – gloves, goggles, boots, apron, respirator (if required).
iii. Contain the spill using absorbents (sand, sawdust, commercial spill kits).
iv. Prevent spread – block drains, ditches.
v. Clean up solid/liquid using appropriate methods.
vi. Collect contaminated material in red bags/containers and label as hazardous.
vii. Decontaminate area with disinfectant/neutralizer.
viii. Report the incident to the Substation In-Charge and record in accident register

8. Training and Awareness

- All substation staff must be trained annually on:
  - MSW segregation
  - Hazardous waste handling
  - Use of PPE
  - Spill containment and cleanup
- Display color-coded signage and Do's & Don'ts prominently.

9. Record Keeping

Maintain the following:

- Daily waste logbook
- Hazardous waste manifest and inventory
- Disposal receipts from authorized handlers
- Spill incident reports
- Training attendance sheets

10. Prohibited Practices

- Burning of waste inside or near substation
- Mixing hazardous waste with general waste
- Storage of waste beyond regulatory limits
- Unauthorized disposal or sale of used oil, batteries, or e-waste

Appendix 17 : IFC Benchmark Standards for Workers Accommodation

PART II: STANDARDS FOR AND MANAGEMENT OF WORKERS' ACCOMMODATION

I. Standards for workers' accommodation

This section looks at the principles and standards applicable to the location and construction of workers' accommodation, including the transport systems provided, the general living facilities, rooms/dormitories facilities, sanitary facilities, canteen and cooking facilities, food safety, medical facilities and leisure/social facilities.

A. National/local standards

The key standards that need to be taken into consideration, as a baseline, are those contained in national/local regulations. Although it is quite unusual to find regulations specifically covering workers' accommodation, there may well be general construction standards which will be relevant. These may include the following standards:

- Building construction: for example, quality of material, construction methods, resistance to earthquakes.
- Housing and public housing: in some countries regulations for housing and public housing contain requirements on issues such as the basic amenities, and standards of repair.
- General health, safety and security: requirements on health and safety are often an important part of building standards and might include provisions on occupation density, minimal air volumes, ventilation, the quality of the flooring (slip-resistant) or security against intrusion.
- Fire safety: requirements on fire safety are common and are likely to apply to housing facilities of any type. This can include provision on fire extinguishers, fire alarms, number and size of staircases and emergency exits, restrictions on the use of certain building materials.
- Electricity, plumbing, water and sanitation: national design and construction standards often include very detailed provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/ equipment.

Benchmark

1. The relevant national and local regulations have been identified and implemented.

B. General living facilities

Ensuring good standards in living facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents, as well as to maintain a good level of morale. The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards. It is also important that workers' accommodation is unaffected by the environmental or operational impacts of the worksite (for example noise, emissions or dust) but is sufficiently close that workers do not have to spend undue amounts of time travelling from their accommodation to the worksite. Living facilities should be built using adequate materials and should always be kept in good repair, clean and free from rubbish and other refuse.

Benchmarks

1. Living facilities are located to avoid flooding and other natural hazards.
2. Where possible, living facilities are located within a reasonable distance from the worksite.
3. Transport from the living facilities to worksite is safe and free.
4. The living facilities are built with adequate materials, kept in good repair and kept clean and free from rubbish and other refuse.

Drainage

The presence of stagnant water is a factor of proliferation of potential disease vectors such as mosquitoes, flies and others, and must be avoided.

Benchmarks

1. The building site is adequately drained to avoid the accumulation of stagnant water.

Heating, air conditioning, ventilation and light
Heating, air-conditioning and ventilation should be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time.

Benchmarks

1. For facilities located in cold weather zones, the temperature is kept at a level of around 20 degrees Celsius notwithstanding the need for adequate ventilation.

2. For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems are provided.

3. Both natural and artificial lighting are provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area. Emergency lighting is provided.

Water
Special attention to water quality and quantity is absolutely essential. To prevent dehydration, water poisoning and diseases resulting from lack of hygiene, workers should always have easy access to a source of clean water. An adequate supply of potable water must be available in the same buildings where bedrooms or dormitories are provided. Drinking water must meet local or WHO drinking water standards[7] and water quality must be monitored regularly. Depending on the local context, it could either be produced by dedicated catchment and treatment facilities or tapped from existing municipal facilities if their capacity and quality are adequate.

Benchmarks

1. Access to an adequate and convenient supply of free potable water is always available to workers. Depending on climate, weather conditions and accommodation standards, 80 to 180 litres per person per day are available.

2. Drinking water meets national/local or WHO drinking water standards.[8]

3. All tanks used for the storage of drinking water are constructed and covered as to prevent water stored therein from becoming polluted or contaminated.

4. Drinking water quality is regularly monitored.

Wastewater and solid waste
Wastewater treatment and effluent discharge as well as solid waste treatment and disposal must comply with local or World Bank effluent discharge standards[9] and be adequately designed to prevent contamination of any water body, to ensure hygiene and to avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents, and other pest vectors. Depending on the local context, treatment and disposal services can be either provided by dedicated or existing municipal facilities.

Benchmarks

1. Wastewater, sewage, food and any other waste materials are adequately discharged, in compliance with local or World Bank standards – whichever is more stringent – and without causing any significant impacts on camp residents, the biophysical environment or surrounding communities.

2. Specific containers for rubbish collection are provided and emptied on a regular basis. Standards range from providing an adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents. In addition it is best practice to locate rubbish containers 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials.

3. Pest extermination, vector control and disinfection are carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.

7. www.who.int/water_sanitation_health/dwq/en/
8. ibid

9. As per the "Pollution Prevention and Abatement Handbook", World Bank Group, July 1998, available from www.worldbank.org

C. Room/dormitory facilities

The standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Overcrowding should be avoided particularly. This also has an impact on workers' productivity and reduces work-related accidents. It is generally acknowledged that rooms/dormitories should be kept clean and in a good condition. Exposure to noise and odour should be minimised. In addition, room/dormitory design and equipment should strive to offer workers a maximum of privacy. Resorting to dormitories should be minimised and single or double rooms are preferred. Dormitories and rooms must be single-sex.

Benchmarks

1. Rooms/dormitories are kept in good condition.

2. Rooms/dormitories are aired and cleaned at regular intervals.

3. Rooms/dormitories are built with easily cleanable flooring material.

4. Sanitary facilities are located within the same buildings and provided separately for men and women.

5. Density standards are expressed either in terms of minimal volume per resident or of minimal floor space. Usual standards range from 10 to 12.5 cubic metres (volume) or 4 to 5.5 square metres (surface).

6. A minimum ceiling height of 2.10 metres is provided.

7. In collective rooms, which are minimised, in order to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers.

8. All doors and windows should be lockable, and provided with mosquito screens where conditions warrant.

9. There should be mobile partitions or curtains to ensure privacy.

10. Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light.

11. Separate sleeping areas are provided for men and women, except in family accommodation.

Additional issue

Irrespective of whether workers are supposed to keep their facilities clean, it is the responsibility of the accommodation manager to ensure that rooms/dormitories and sanitary facilities are in good condition.

Bed arrangements and storage facilities

The provision of an adequate numbers of beds of an appropriate size is essential to provide workers with decent, safe and hygienic conditions to rest and sleep. Here again, particular attention should be paid to privacy. Consideration should be given to local customs so beds could be replaced by hammocks or sleeping mats for instance.

Benchmarks

1. A separate bed for each worker is provided. The practice of "hot-bedding" should be avoided.

2. There is a minimum space between beds of 1 metre.

3. Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimised. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from to 0.7 to 1.10 metres.

4. Triple deck bunks are prohibited.

5. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding.

6. Bed linen is washed frequently and applied with repellents and disinfectants where conditions warrant (malaria).

7. Facilities for the storage of personal belongings for workers are provided. Standards vary from providing an individual cupboard for each worker to providing 475-litre big lockers and 1 metre of shelf unit.

8. Separate storage for work boots and other personal protection equipment, as well as drying/airing areas may need to be provided depending on conditions.

D. Sanitary and toilet facilities

It is essential to allow workers to maintain a good standard of personal hygiene but also to prevent contamination and the spread of diseases which result from inadequate sanitary facilities. Sanitary and toilet facilities will always include all of the following: toilets, urinals, washbasins and showers. Sanitary and toilet facilities should be kept in a clean and fully working condition. Facilities should also be constructed of materials that are easily cleanable and ensure privacy. Sanitary and toilet facilities are never shared between male and female residents, except in family accommodation. Where necessary, specific additional sanitary facilities are provided for women.

Benchmarks

1. Sanitary and toilet facilities are constructed of materials that are easily cleanable.

2. Sanitary and toilet facilities are cleaned frequently and kept in working condition.

3. Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.

4. Sanitary and toilet facilities are not shared between men and women, except in family accommodation.

Toilet facilities

Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease.

Benchmarks

1. An adequate number of toilets is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons.

2. Toilet facilities are conveniently located and easily accessible. Standards range from 30 to 60 metres from rooms/dormitories. Toilet rooms shall be located so as to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located. Toilets and other sanitary facilities should be ("must be" in cold climates) in the same building as rooms and dormitories.

Showers/bathrooms and other sanitary facilities

Hand wash basins and showers should be provided in conjunction with rooms/dormitories. These facilities must be kept in good working condition and cleaned frequently. The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained. Adequate space must be provided for hanging, drying and airing clothes. Suitable light, ventilation and soap should be provided. Lastly, hand washing, shower and other sanitary facilities should be located within a reasonable distance from other facilities and from sleeping facilities in particular.

Benchmarks

1. Shower/bathroom flooring is made of anti-slip hard washable materials.

2. An adequate number of handwash facilities is provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.

3. An adequate number of shower/bathroom facilities is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.

4. Showers/bathrooms are conveniently located.

5. Shower/bathroom facilities are provided with an adequate supply of cold and hot running water.

E. Canteen, cooking and laundry facilities

Good standards of hygiene in canteen/dining halls and cooking facilities are crucial. Adequate canteen, cooking and laundry facilities and equipments should also be provided. When caterers are contracted to manage kitchens and canteens, special attention should be paid to ensure that contractors take into account and implement the benchmarks below, and that adequate reporting and monitoring mechanisms are in place. When workers can individually cook their meals, they should be provided with a space separate from the sleeping areas. Facilities must be kept in a clean and sanitary condition. In addition, canteen, kitchen, cooking and laundry floors, ceilings and walls should be made of easily cleanable materials.

Benchmarks

1. Canteen, cooking and laundry facilities are built in adequate and easy to clean materials.

2. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition.

3. If workers can cook their own meals, kitchen space is provided separate from sleeping areas.

Laundry facilities

Providing facilities for workers to wash both work and non-work related clothes is essential for personal hygiene. The alternative is for the employer to provide a free laundry service.

Benchmarks

1. Adequate facilities for washing and drying clothes are provided. Standards range from providing sinks or tubs with hot and cold water, cleaning soap and drying lines to providing washing machines and dryers.

2. When work clothes are used in contact with dangerous substance (for example, application of pesticide), special laundry facilities (washing machines) should be provided.

Additional issue

When workers are provided with facilities allowing them to individually do their laundry or cooking, it should be the responsibility of each worker to keep the facilities in a clean and sanitary condition. Nonetheless, it is the responsibility of the accomodation manager to make sure the standards are respected and to provide an adequate cleaning, disinfection and pest/vector control service when necessary.

Additional issue

When the employer provides family accommodation, it is best practice to provide each family with a private kitchen or the necessary cooking equipment to allow the family to cook on their own.

Canteen and cooking facilities

Canteen and cooking facilities should provide sufficient space for preparing food and eating, as well as conform to hygiene and safety requirements.

Benchmarks

1. Canteens have a reasonable amount of space per worker. Standards range from 1 square metre to 1.5 square metres.

2. Canteens are adequately furnished. Standards range from providing tables, benches, individual drinking cups and plates to providing special drinking fountains.

3. Places for food preparation are designed to permit good food hygiene practices, including protection against contamination between and during food preparation.

4. Kitchens are provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean, running water and materials for hygienic drying.

5. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

6. All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.

7. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable and washable surface.

8. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided.

9. Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.

F. Standards for nutrition and food safety

When cooking for a number of workers, hygiene and food safety are absolutely critical. In addition to providing safe food, providing nutritious food is important as it has a very direct impact on workers' productivity and well-being. An ILO study demonstrates that good nutrition at work leads to gains in productivity and worker morale, prevention of accidents and premature deaths and reductions in health care costs.[10]

Benchmarks

1. The WHO 5 keys to safer food or an equivalent process is implemented (see Box 6 below).

2. Food provided to workers contains an appropriate level of nutritional value and takes into account religious/cultural backgrounds; different choices of food are served if workers have different cultural/ religious backgrounds.

3. Food is prepared by cooks. It is also best practice that meals are planned by a trained nutritionist.

Box 6 - Five keys to safer food

Keep clean	
Wash your hands before handling food and often during food preparation. Wash your hands after going to the toilet. Wash and sanitise all surfaces and equipment used for food preparation. Protect kitchen areas and food from insects, pests and other animals.	While most micro organisms do not cause disease, dangerous micro organisms are widely found in soil, water, animals and people. These micro organisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause food borne diseases.
Separate raw and cooked	
Separate raw meat, poultry and seafood from other foods. Use separate equipment and utensils such as knives and cutting boards for handling raw foods. Store food in containers to avoid contact between raw and prepared foods.	Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous micro organisms which may be transferred onto other foods during food preparation and storage.
Cook thoroughly	
Cook food thoroughly, especially meat, poultry, eggs and seafood. Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer. Reheat cooked food thoroughly.	Proper cooking kills almost all dangerous micro organisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.
Keep food at safe temperatures	
Do not leave cooked food at room temperature for more than 2 hours. Refrigerate promptly all cooked and perishable food (preferably below 5°C). Keep cooked food piping hot (more than 60°C) prior to serving. Do not store food too long even in the refrigerator. Do not thaw frozen food at room temperature.	Micro organisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of micro organisms is slowed down or stopped. Some dangerous micro organisms still grow below 5°C.
Use safe water and raw materials	
Use safe water or treat it to make it safe. Select fresh and wholesome foods. Choose foods processed for safety, such as pasteurised milk. Wash fruits and vegetables, especially if eaten raw. Do not use food beyond its expiry date.	Raw materials, including water and ice, may be contaminated with dangerous micro organisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Take care in selection of raw materials and implement simple measures such as washing.

Source: World Health Organization, Food Safety
www.who.int/foodsafety/publications/consumer/en/5keys_en.pdf

10. C. Wanjek (2005). "Food at Work - Workplace solutions for malnutrition, obesity and chronic disease". International Labour Organization, Geneva.

G. Medical facilities

Access to adequate medical facilities is important to maintain workers' health and to provide adequate responses in case of health emergency situations. The availability or level of medical facilities provided in workers' accommodation is likely to depend on the number of workers living on site, the medical facilities already existing in the neighbouring communities and the availability of transport. However, first aid must always be available on site.

First aid facilities
Providing adequate first aid training and facilities can save lives and prevent minor injuries becoming major ones.

Other medical facilities
Depending on the number of workers living on site and the medical services offered in the surrounding communities, it is important to provide workers with additional medical facilities. Special facilities for sick workers and medical services such as dental care, surgery, a dedicated emergency room can, for instance, be provided.

Benchmarks

1. A number of first aid kits adequate to the number of residents are available.

2. First aid kits are adequately stocked. Where possible a 24/7 first aid service/facility is available.

3. An adequate number of staff/workers is trained to provide first aid.

4. Where possible and depending on the medical infrastructures existing in the community, other medical facilities are provided (nurse rooms, dental care, minor surgery).

Box 7 - UK/HSE First Aid facilities

What should be in a first aid kit?

There is no standard list and it very much depends on the assessment of the needs in a particular workplace:

- a leaflet giving general guidance on first aid, for example HSE leaflet *Basic advice on first aid at work*
- individually wrapped sterile adhesive dressings (assorted sizes)
- two sterile eye pads
- four individually wrapped triangular bandages (preferably sterile)
- six safety pins
- six medium-sized (approximately 12 cm x 12 cm) individually wrapped sterile unmedicated wound dressings
- two large (approximately 18 cm x 18 cm) sterile individually wrapped unmedicated wound dressings
- one pair of disposable gloves.

What should be kept in the first aid room?

The room should contain essential first aid facilities and equipment. Typical examples of these are:

- a sink with hot and cold running water
- drinking water and disposable cups
- soap and paper towels
- a store for first aid materials
- foot-operated refuse containers, lined with disposable yellow clinical waste bags or a container for the safe disposal of clinical waste
- a couch with waterproof protection, clean pillows and blankets
- a chair
- a telephone or other communication equipment
- a record book for recording incidents where first aid has been given.

Source: UK Health and Safety Executive

H. Leisure, social and telecommunication facilities

Basic leisure and social facilities are important for workers to rest and also to socialise during their free time. This is particularly true where workers' accommodation is located in remote areas far from any communities. Where workers' accommodation is located in the vicinity of a village or a town, existing leisure or social facilities can be used so long as this does not cause disruption to the access and enjoyment of local community members. But in any case, social spaces should also be provided on site. Exercise and recreational facilities will increase workers' welfare and reduce the impact of the presence of workers in the surrounding communities. In addition it is also important to provide workers with adequate means to communicate with the outside world, especially when workers' accommodation is located in a remote location or where workers live on site without their family or are migrants. Consideration of cultural attitudes is important. Provision of space for religious observance needs to be considered, taking account of the local context and potential conflicts in certain situations.

Benchmarks

1. Basic collective social/rest spaces are provided to workers. Standards range from providing workers multi-purpose halls to providing designated areas for radio, TV, cinema.

2. Recreational facilities are provided. Standards range from providing exercise equipment to providing a library, swimming pool, tennis courts, table tennis, educational facilities.

3. Workers are provided with dedicated places for religious observance if the context warrants.

4. Workers have access to public phones at affordable/public prices (that is, not inflated).

5. Internet facilities can also be provided, particularly where large numbers of expatriates/Third Country Nationals (TCNs) are accommodated.

Box 8 - Examples of social/leisure facilities

In Qatar there is a newly built 170-hectare complex which accommodates contractors and more than 35,000 workers for a project run by a major oil company. At the heart of this complex, the recreation area includes extensive sport facilities, a safety-training centre, an outdoor cinema and a park. The purpose of those facilities goes beyond providing adequate accommodation to the large numbers of contractors and workers on this project but is designed to provide the same level of services as a small town. The accommodation complex has a mayor, as well as a dedicated welfare team which is responsible for the workers' welfare, cultural festivals and also acts as the community's advocates.

II. Managing workers' accommodation

Once the living facilities have been constructed and are operational, effective ongoing management of living facilities is essential. This encompasses issues such as the physical maintenance of buildings, security and consultation with residents and neighbouring communities in order to ensure the implementation of the housing standards in the long term.

A. Management and staff

Worker camps and housing facilities should have a written management plan, including management policies or plans on health and safety, security, living conditions, workers' rights and representation, relationships with the communities and grievance processes. Part of those policies and plans can take the form of codes of conduct. The quality of the staff managing and maintaining the accommodation facilities will have a decisive impact on the level of standards which are implemented and the well-being of workers (for instance on the food safety or overall hygiene standards). It is therefore important to ensure that managers are competent and other workers are adequately skilled. The manager will be responsible for overseeing staff, for ensuring the implementation of the accommodation standards and for the implementation of the management plans. It is important the accommodation manager has the corresponding authority to do so.

If the facility is being managed by a contractor, as is often the case, the expected housing and management standards should be specified in the relevant contract, and mechanisms to ensure that those standards are implemented should be set up. As part of this process, the accommodation manager (or contractor) should have a duty to monitor the application of the accommodation standards and to report frequently on their implementation to the client.

Benchmarks

1. There are management plans and policies especially in the field of health and safety (with emergency responses), security, workers' rights, relationships with the communities.

2. An appointed person with the adequate background and experience is in charge of managing the workers' accommodation.

3. If contractors are being used, there are clear contractual management responsibilities and monitoring and reporting requirements.

4. Depending on the size of the accommodation, there is a sufficient number of staff in charge of cleaning, cooking and of general maintenance.

5. Such staff are recruited from the local communities.

6. Staff have received basic health and safety training.

7. Persons in charge of the kitchen are trained in nutrition and food-handling and adequately supervised.

B. Charging fees for accommodation and services

Charging fees for the accommodation or the services provided to workers such as food or transport should be avoided where workers do not have the choice to live or eat anywhere else, or if deemed unavoidable, should take into account the specific nature of workers' accommodation. Any charges should be transparent, discussed during recruitment and specified in workers' contracts. Any such charges should still leave workers with sufficient income and should never lead to a worker becoming indebted to an employer.

Benchmarks

1. When fees are charged, workers are provided with clear information and a detailed description of all payments made such as rent, deposit and other fees.

2. When company housing is considered to be part of workers' wages, it is best practice that workers are provided with an employment contract clearly specifying housing arrangements and regulations, in particular rules concerning payments and fees, facilities and services offered and rules of notice.

3. When fees are charged, the renting arrangements are fair and do not cost the worker more than a small proportion of income and never include a speculative profit.

4. Food and other services are free or are reasonably priced, never above the local market price.

5. The provision of accommodation or other services by employers as a payment for work is prohibited.

Additional issue

To avoid that fair renting arrangements turn into unfair ones, any deposit of advance should be set at a reasonable level and it is best practice that renting prices include a fixed fee covering the water needed and the use of the energy required to the functioning of the heating/cooling/ventilation/ cooking systems. However, in such cases it might be necessary to raise workers' awareness to ensure that workers will use the facilities responsibly, particularly in areas where water is scarce.

C. Health and safety on site

The company or body in charge of managing the workers' accommodation should have the prime responsibility for ensuring workers' physical well-being and integrity. This involves making sure that the facilities are kept in good condition (ensuring that sanitary standards or fire regulations are respected for instance) and that adequate health and safety plans and standards are designed and implemented.

Benchmarks

1. Health and safety management plans including electrical, mechanical, structural and food safety have been carefully designed and are implemented.

2. The person in charge of managing the accommodation has a specific duty to report to the health authorities the outbreak of any contagious diseases, food poisoning and other important casualties.

3. An adequate number of staff/workers is trained to provide first aid.

4. A specific fire safety plan is prepared, including training of fire wardens, periodic testing and monitoring of fire safety equipment and periodic drills.

5. Guidance on the detrimental effects of the abuse of alcohol and drugs and other potentially harmful substances and the risk and concerns relating to HIV/AIDS and of other health risk-related activities is provided to workers. It is best practice to develop a clear policy on this issue.

6. Workers have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

7. Workers have easy access to medical facilities and medical staff. Where possible, female doctors/nurses should be available for female workers.

8. Emergency plans on health and fire safety are prepared. Depending on the local context, additional emergency plans are prepared as needed to handle specific occurrences (earthquakes, floods, tornadoes).

D. Security of workers' accommodation

Ensuring the security of workers and their property on the accommodation site is of key importance. To this end, a security plan must be carefully designed including appropriate measures to protect workers against theft and attacks. Policies regarding the use of force (force can only be used for preventive and defensive purposes in proportion to the nature and the extent of the threat) should also be carefully designed. To implement those plans, it may be necessary to contract security services or to recruit one or several staff whose main responsibility is to provide security to safeguard workers and property. Before making any security arrangements, it is necessary to assess the risks of such arrangements to those within and outside the workers' accommodation and to respect best international practices, including IFC PS4 and EBRD PR4 and applicable law.[11] Particular attention should be paid to the safety and security of women workers.

Benchmarks

1. A security plan including clear measures to protect workers against theft and attack is implemented.

2. A security plan including clear policies on the use of force has been carefully designed and is implemented.

3. Security staff have been checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staff from both genders are recruited.

4. Security staff have a clear mandate and have received clear instruction about their duties and responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers.

5. Security staff have received adequate training in dealing with domestic violence and the use of force.

6. Security staff have a good understanding about the importance of respecting workers' rights and the rights of the communities.

7. Body searches are only allowed in specific circumstances and are performed by specially trained security staff using the least-intrusive means possible. Pat down searches on female workers can only be performed by female security staff.

8. Security staff adopt an appropriate conduct towards workers and communities.

9. Workers and members of the surrounding communities have specific means to raise concerns about security arrangement and staff.

11. See for instance the Voluntary Principles on Security and Human Rights, www.voluntaryprinciples.org/principles

E. Workers' rights, rules and regulations on workers' accommodation

Freedoms and human rights of workers should be recognised and respected within their living quarters just as within the working environment. House rules and regulations should be reasonable and non discriminatory. It is best practice that workers' representatives are consulted about those rules. House rules and regulations should not prevent workers from exercising their basic rights. In particular, workers' freedom of movement needs to be preserved if they are not to become effectively "trapped". To this end it is good practice to provide workers with 24/7 access to the accommodation and free transport services to and from the surrounding communities. Any restriction to this freedom of movement should be limited and duly justified. Penalties for breaking the rules should be proportional and implemented through a proper procedure allowing workers to defend themselves and to challenge the decision taken. The relationship between continuing employment and compliance with the rules of the workers' accommodation should be clear and particular attention should be paid to ensure that housing rules do not create indirect limitation of the right to freedom of association. Best practice might include a code of conduct relating to the accommodation to be signed together with the contract of employment.

Box 9 - Dole housing plantation regulation in Costa Rica

In every plantation there is an internal accommodation regulation that every worker is required to sign together with his/her employment contract. That document describes the behaviour which is expected from workers at all times and basic rules such as the prohibition of alcohol and the interdiction to make noise after a certain time at night. In case there is any problem concerning the application of those internal rules, a set of disciplinary procedures which have been designed with the workers' representatives can be enforced. Workers are absolutely free to enter or leave the site and do not have any restrictions in relation to accessing their living quarters. Families are not allowed in the living quarters unless they have been registered for a visit.

Benchmarks

1. Restriction of workers' freedom of movement to and from the site is limited and duly justified. It is good practice to provide workers 24/7 access to the accommodation site. Any restrictions based on security reasons should be balanced by the necessity to respect workers' freedom of movement.

2. Where possible, an adequate transport system to surrounding communities is provided. It is good practice to provide workers with free transportation to and from local communities.

3. Withholding workers' ID papers is prohibited.

4. Freedom of association is expressly respected. Provisions restricting workers' rights on site should take into account the direct and indirect effect on workers' freedom of association. It is best practice to provide trade union representatives access to workers in the accommodation site.

5. Workers' gender and religious, cultural and social backgrounds are respected. In particular, workers should be provided with the possibility of celebrating religious holidays and observances.

6. Workers are made aware of their rights and obligations and are provided with a copy of the internal workers' accommodation rules, procedures and sanction mechanisms in a language or through a media which they understand.

7. Housing regulations, including those relating to allocation of housing, should be non-discriminatory. Any justifiable discriminatory rules – for example all-male dormitories – should be strictly limited to the rules which are necessary to ensure the smooth running of the worker camp and to maintain a good relationship with the surrounding communities.

8. Where possible, visitor access should be allowed.

9. Decisions should be made on whether to prohibit alcohol, tobacco and third party access or not from the camp and the relevant rules should be clearly communicated to all residents and workers.

10. A fair and non-discriminatory procedure exists to implement disciplinary procedures including the right of workers to defend themselves (see also next section).

Appendix 18 : Climate and Disaster Risk Screening for 132/33kV GIS at Titabor and 132/33kV AIS at Chabua

Summary Climate and Disaster Risk Screening Report

1. Exposure of the project location: This step assesses the current and future exposure of the project location to relevant climate and geophysical hazards as an aggregate.

Exposure Rating

High

Climate and geophysical hazards that are likely to be relevant to the project location both in present and in the future

- Extreme Temperature
- Extreme Precipitation and Flooding
- Strong Winds
- Geophysical Hazards

2. Impacts on the project's physical infrastructure and assets: This step assesses the current and future impacts of identified climate and geophysical hazards on the project's physical infrastructure and assets as currently designed.

Impact Rating

Moderate

Relevant project subsectors

- Transmission & Distribution
- Energy Efficiency in Heat & Power

3. Modulation of risks by the project's development context: This step assesses how the project's soft components as currently designed, together with the project's broader development context, modulate potential impacts from climate and geophysical hazards. This step also considers particularly vulnerable groups, namely women, migrants and displaced populations.

Modulation of risks by the project's soft components

Reduce Risk

Selected soft components

- Energy, Laws, regulations, Policy analysis and development
- Strategic Energy System Planning
- Feasibility, Design Studies
- Capacity Building, technical Assistance and Outreach
- Institutional Strengthening,Training,Knowledge Exchange

Modulation of risks by the project's development context

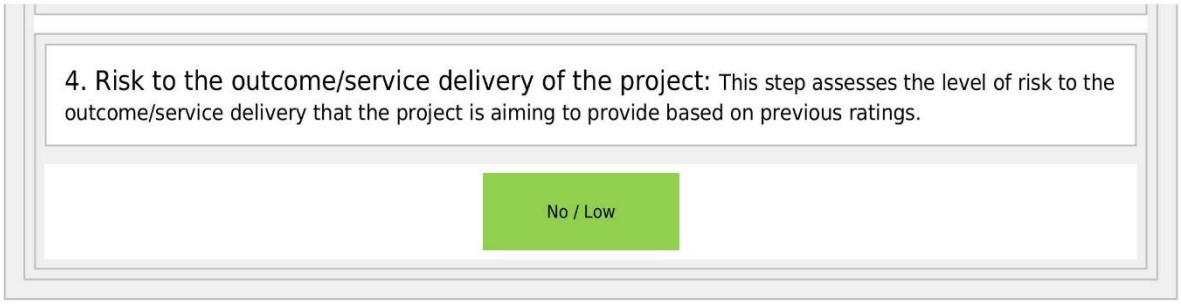
Reduce Risk

Women identified as particularly vulnerable to impacts from climate and geophysical hazards

Yes

Components designed to help alleviate the risks to women from climate and geophysical hazards

Yes


4. Risk to the outcome/service delivery of the project: This step assesses the level of risk to the outcome/service delivery that the project is aiming to provide based on previous ratings.
No / Low

Notes from the Screening Process

1. Exposure of the project location

Exposure Rating High

This step provides information on exposure to climate and geophysical hazards at the project location. **The Exposure rating is High.The project location has experienced climate and geophysical hazards in the past and is expected to experience these in the future with high intensity, frequency, or duration.** The rating is based on climate information drawing on global, quality controlled data sets from the Climate Change Knowledge Portal. It is useful, for example to understand the temperature range and the rate of annual or decadal increase in a region; or precipitation patterns for historical and future time frames and seasonality shifts. Understanding the trends of hazards is important as they act individually and collectively on project components/subsectors.

TThe following guiding questions were used to assess exposure:

- What have been the historical trends in temperature, precipitation and drought conditions?
- How are these trends projected to change in the future in terms of intensity, frequency and duration?
- Has the location experienced strong winds and/or geophysical hazards in the past that may occur again in the future?
- Will the location be exposed to sea level rise and storm surge in the future?

User Notes: As per the Think Hazard web-based tool, the subproject sites at Titabor and Chabua faces multiple climate and geophysical risks. The river flood hazard is high, with potentially life-threatening floods expected at least once every 10 years, while extreme heat hazard is also high, with severe heat stress events likely at least once in the next five years. Additionally, wildfire hazard is classified as high, with over a 50% chance of encountering extreme fire weather conditions annually. The site also has a medium earthquake hazard, with a 10% probability of significant seismic activity in the next 50 years.

2. Impacts on the project's physical infrastructure and assets

Impact Rating Moderate

This step provides an indication of the potential impacts of climate and geophysical hazards on the project's physical infrastructure and assets as currently designed under relevant subsectors. **The Impact rating is Moderate.Climate and geophysical hazards are likely to impact the structural integrity, materials, siting, longevity and overall effectiveness of your investments..** The impact rating is based on the exposure rating and the understanding of the project's sensitivity by the user. Please note that for this step the tool is helping judge the effect these impacts may have on the investment, and the ability of the project to sustain and enhance physical infrastructures and assets under a changing climate. Understanding where risks may exist and identifying where further work may be required to reduce or manage these risks can help inform the process of dialogue, consultation and analysis during project design.

The following guiding questions were used to assess impact:

- Have recent trends and projected changes in climate and geophysical hazards affected your project's infrastructure and activities as currently designed?
- Are project designs appropriate given recent trends in climate hazards?
- Do the investments in infrastructure design standards “lock in” certain decisions for decades to come
- Have future maintenance costs been adequately factored into the project design??

User Notes: The sub-project have been designed with robust engineering standards, ensuring resilience against Assam’s tropical climate and geophysical conditions. With materials like galvanized steel, epoxy coatings, and climate-proofing measures, the project is well-equipped to withstand high humidity, corrosion, and extreme weather.

While situated in Seismic Zone V, the infrastructure incorporates structural reinforcements to enhance stability. Additionally, advanced insulation, surge protection, and wind-resistant designs further strengthen its reliability.

Though future climate variations such as intensified rainfall, rising temperatures, and extreme weather events pose potential challenges, the project’s solid foundation, adaptability, and commitment to safety position it well for long-term sustainability and efficiency. With continuous monitoring and proactive upgrades, this infrastructure will remain a reliable

and climate-resilient asset for years to come.

3. Modulation of risks by the project's soft components and development context

This step provides information on how the potential impact on key components/subsectors due to exposure from hazards is modulated by the project's soft components and broader development context. In doing this, this step also takes into account particularly vulnerable groups including women, migrants and displaced populations.

Modulation of risks by the project's soft components	Modulation of risks by the project's development context
Reduce Risk	Reduce Risk
This rating reflects how the project's soft components (enabling and capacity building activities) can modulate risks. The right kind of capacity building measures could increase preparedness and long-term resilience and reduce risk.	This rating reflects how the larger development context, including sector context and other social, economic and political factors can modulate risks.
User Notes: The integration of soft components in the project plays a crucial role in mitigating climate and geophysical risks by enhancing preparedness, resilience, and adaptive capacity. Through comprehensive training, awareness programs, and capacity-building initiatives, field staff and stakeholders can be better equipped to manage extreme weather events, flooding, and seismic risks. Effective early warning systems, improved maintenance protocols, and climate-resilient operational strategies can further reduce vulnerabilities. Additionally, gender considerations are critical, as women often face disproportionate impacts from climate-induced hazards due to socio-economic dependencies on natural resources. Recognizing this, the project includes components aimed at addressing gender-specific vulnerabilities, ensuring equitable access to energy resources and economic opportunities. By fostering inclusivity and integrating climate adaptation measures, the project strengthens resilience not only for infrastructure but also for communities, including vulnerable groups such as migrants and displaced populations who may be disproportionately affected by climate and geophysical challenges.	**User Notes:** *No notes added*

4. Risk to the outcome/service delivery of the project

Outcome/Service Delivery Rating	No / Low

This step provides an indication of the level of risk to the outcome/service delivery that the project is aiming to provide. **The risk to the outcome/service delivery of your project is No / Low.** This rating is derived from hazard information, subject matter expertise, contextual understanding of the project, and modulated on the basis of the

Guidance on Managing Climate Risks through Enhanced Project Design

By understanding which of your project components are most at risk from climate change and other natural hazards through initial screening, you can begin to take measures to avoid impacts by:

- Enhancing the consideration of climate and disaster risks early in project design.
- Using your risk screening analysis to inform follow-up feasibility studies and technical assessments.
- Encouraging local stakeholder consultations and dialogue to enhance resilience measures and overall success of the project.

Table 1 provides some general guidance based on the risk ratings for Outcome/Service Delivery, and Table 2 lists some climate risk management measures for your consideration. Visit the "Screening Resources" section of the landing page for additional guidance and a list of useful resources

Note: Please recall that that this is a high-level screening tool, and that the characterization of risks should be complemented with more detailed work.

Table 1: General Guidance Based on Risk Ratings for Exposure, Impact and Outcome/Service Delivery

Insufficient Understanding	Gather more information to improve your understanding of climate and geophysical hazards and their relationship to your project.
No/Low Risk	If you are confident that climate and geophysical hazards pose no or low risk to the project, continue with project development. However, keep in mind that this is a high-level risk screening at an early stage of project development. Therefore, you are encouraged to monitor the level of climate and geophysical risks to the project as it is developed and implemented.
Moderate Risk	For areas of Moderate Risk, you are encouraged to build on this screening through additional studies, consultation, and dialogue. This initial screening may be supplemented with a more detailed risk assessment to better understand the nature of the risk to the project.
High Risk	For areas of High Risk, you are strongly encouraged to conduct a more detailed risk assessment and to explore measures to manage or reduce those risks.

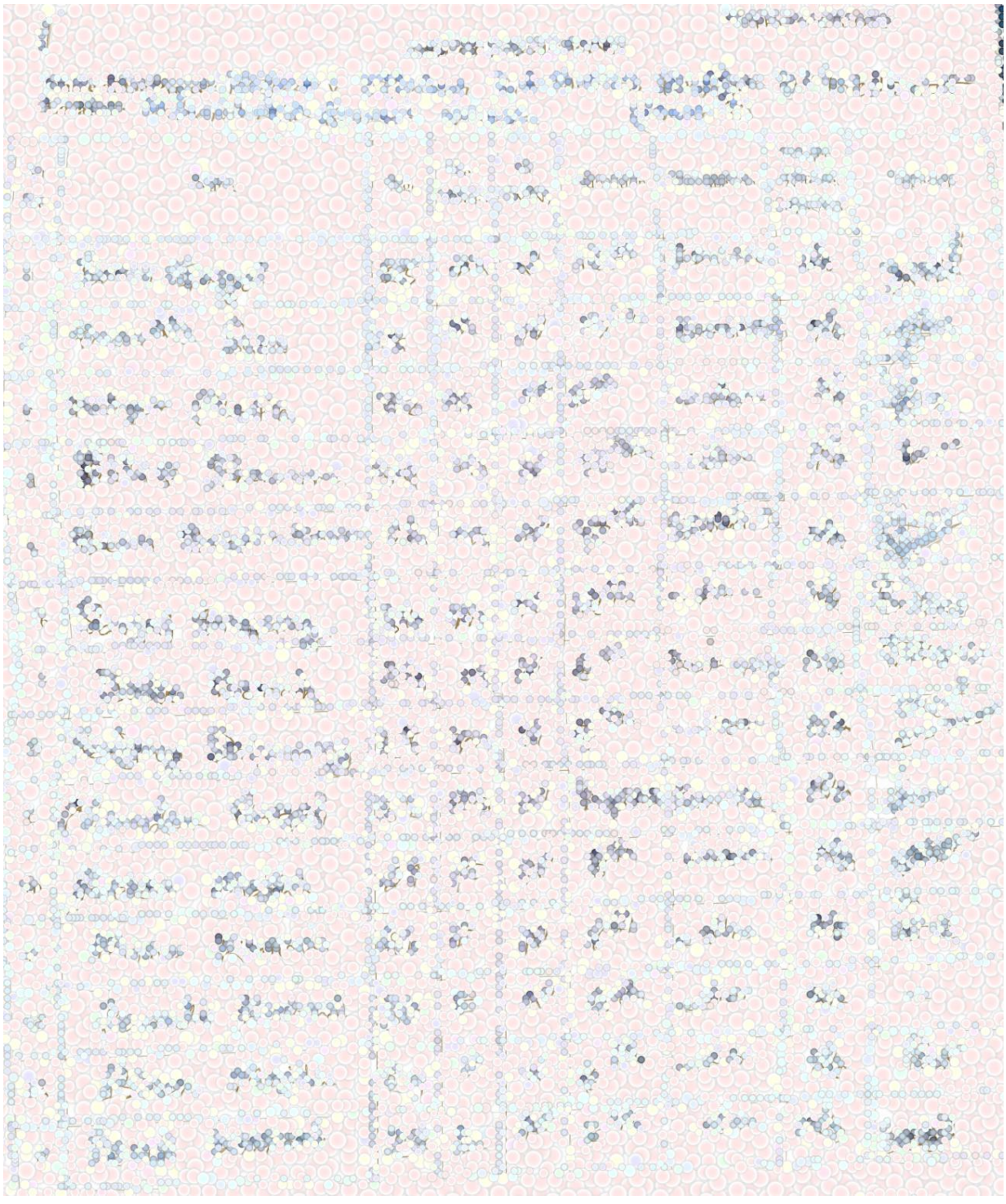
Table 2: Types of Climate Risk Management Measures for Typical energy Projects

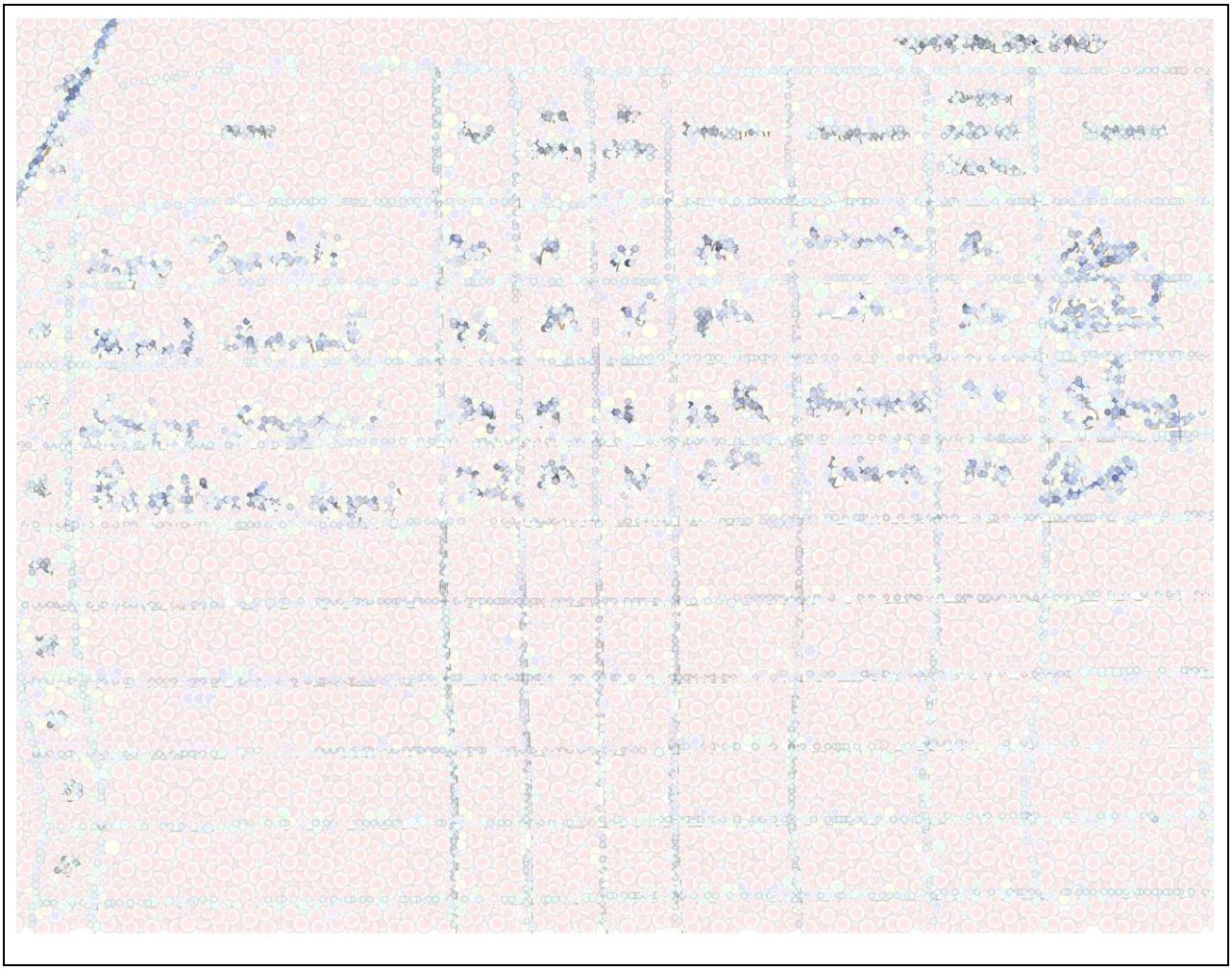
OBJECTIVE	EXAMPLES
Accommodate/Manage	• Develop redundant structures or services that can be relied upon if structures fail • Plan back-up power systems for treatment and pumping facilities • Increase inspection frequency to ensure structures are enduring climate change pressures • For transmission and distribution where higher winds are expected, adopting higher design standards for distribution poles; in the case of increased temperatures, putting in place of more effective cooling systems for substations and transformers • Setting up rapid emergency repair teams to repair damaged facilities quickly

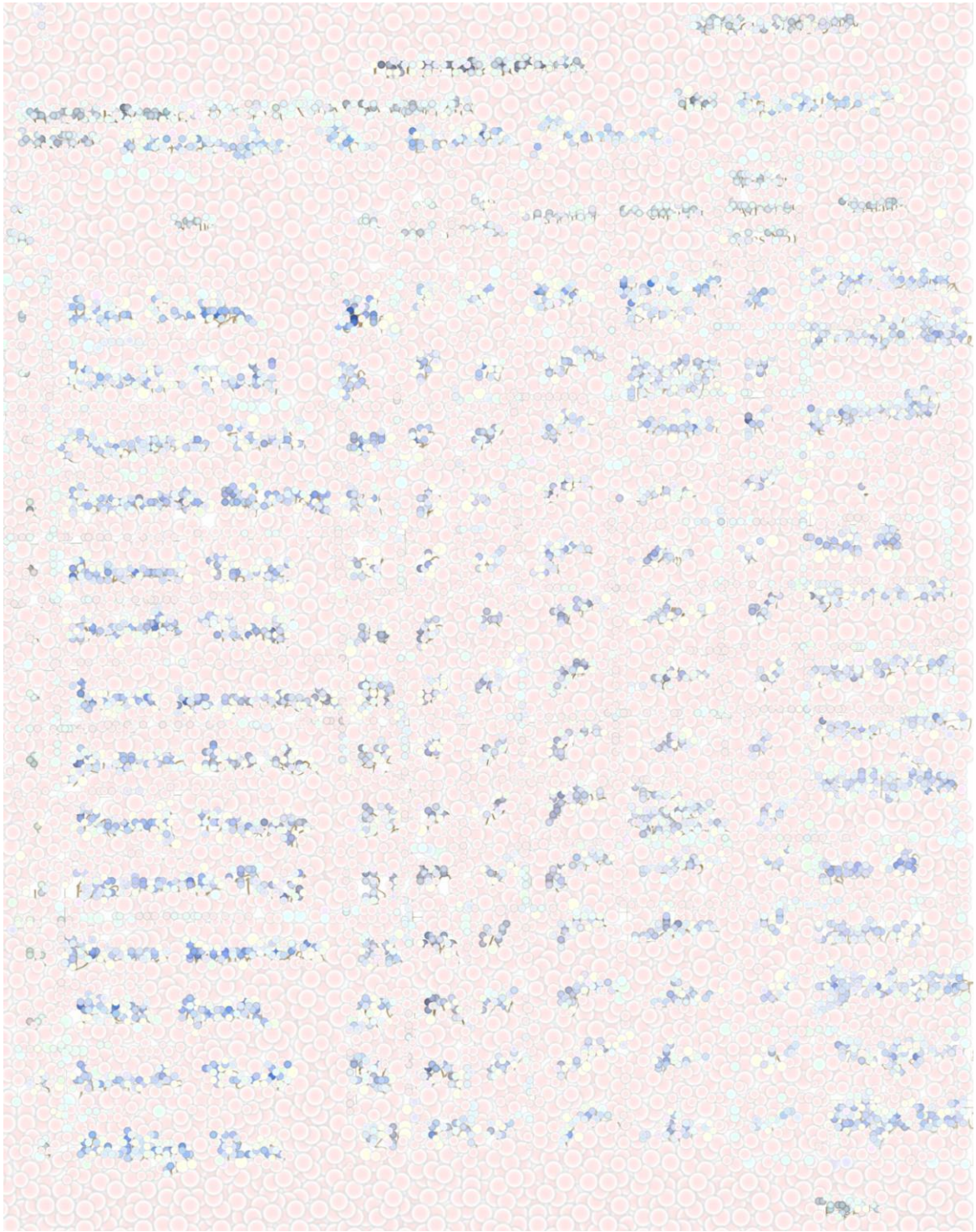
Protect/Harden	• Upgrade existing cooling systems for thermal power • Designing facilities to be waterproofed where increased flooding is expected • Add reinforcements to walls and roofs • Build dikes to contain flooding • Incorporate structural improvements to transmission • For existing hydro infrastructure, operational changes to optimize reservoir management and improve energy output by adapting to changes in rainfall or river flow patterns • For hydropower, restored and better-managed upstream land, including afforestation to reduce floods, erosions and mudslides for a better protection of existing infrastructure • Increase drainage of energy facilities • Employ more robust specifications allowing structures to withstand more extreme conditions (such as higher wind or water velocity) • Design turbines and structures better able to handle increased wind speed and gusts
Retreat/Relocate	• Integrate sea level rise projections and storm surge in coastal siting • Relocate or refit extremely vulnerable existing infrastructure • For hydropower, where water flows changes are expected, consider diverting upstream tributaries, building new storage reservoirs and installing turbines better suited to expected conditions • For transmission & distribution, specifying redundancy in control systems, multiple T&D routes, relocation and underground distribution for protection against adverse conditions may be considered.
Build information collection and management systems	• Strengthen climate information systems, building on existing regional and national networks • For hydropower, strengthen hydrologic forecasting and coordinate power planning and operations with other water-use projects • For electricity end-use, putting in place mandatory minimum energy performance standards for buildings, manufacturing facilities and energy-intensive appliances • Build capacity of national governments to harmonize data across regions • Putting in place more robust operational and maintenance procedures
Strengthen policies, planning and systems	• Integrate climate change and disaster management planning • Improve coordination of policies and programs across government agencies to address the additional pressures imposed by climate change • Foster integrated resource management with agriculture and water • Put in place policies and enforceable regulations to improve energy security, decentralized local planning and generation • Improve forecasting of demand changes and supply-demand with climate change • Improved land-use planning so future power infrastructure is in less vulnerable areas

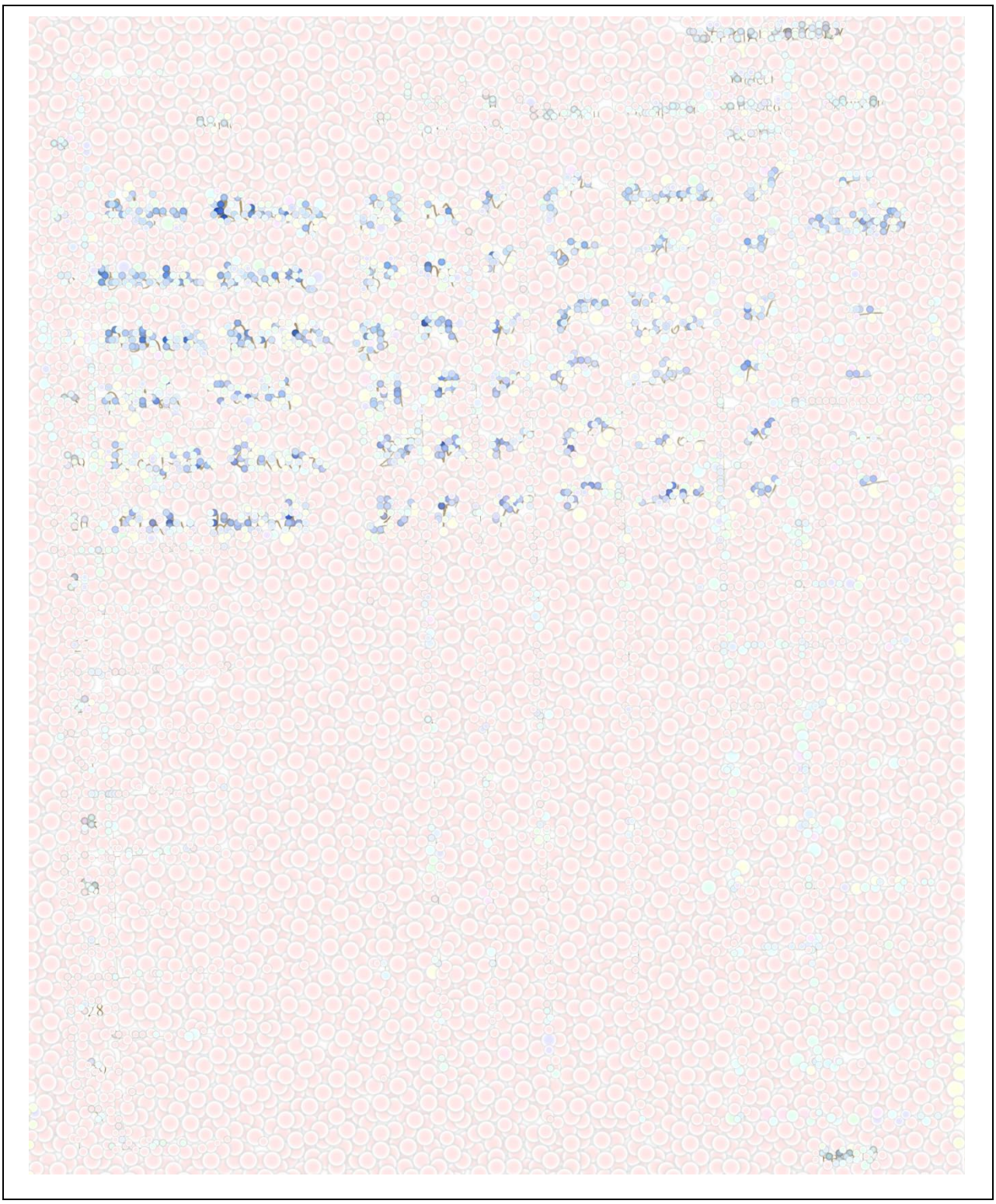
Sources: USAID Climate Risk Screening and Management Tools: Infrastructure, Construction and Energy Annex; ADB Guidelines for Climate Proofing Investments in Energy

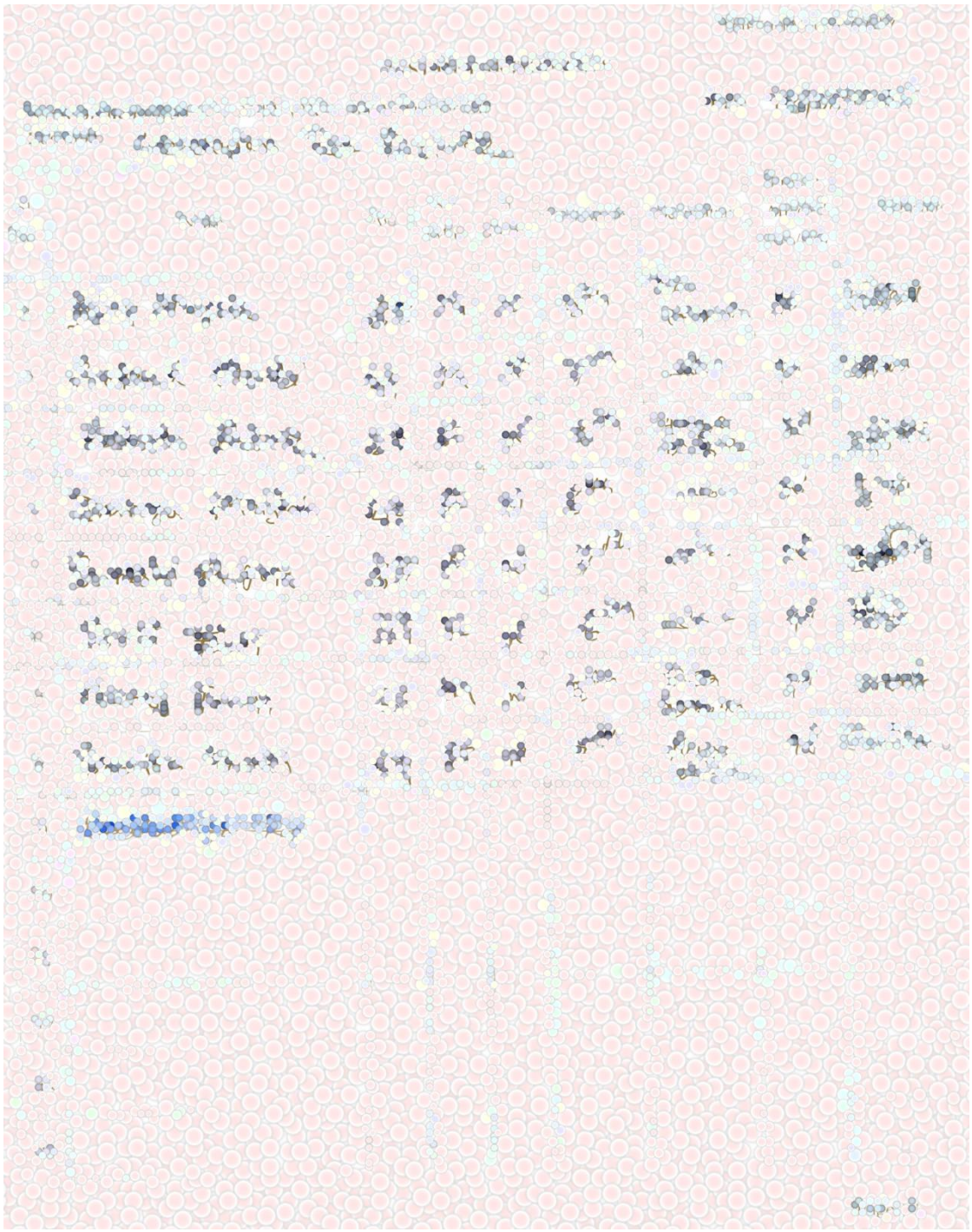
Appendix 19: Attendance Sheet and Photographs of Public Consultation at 132/33 kV Titabor GIS site





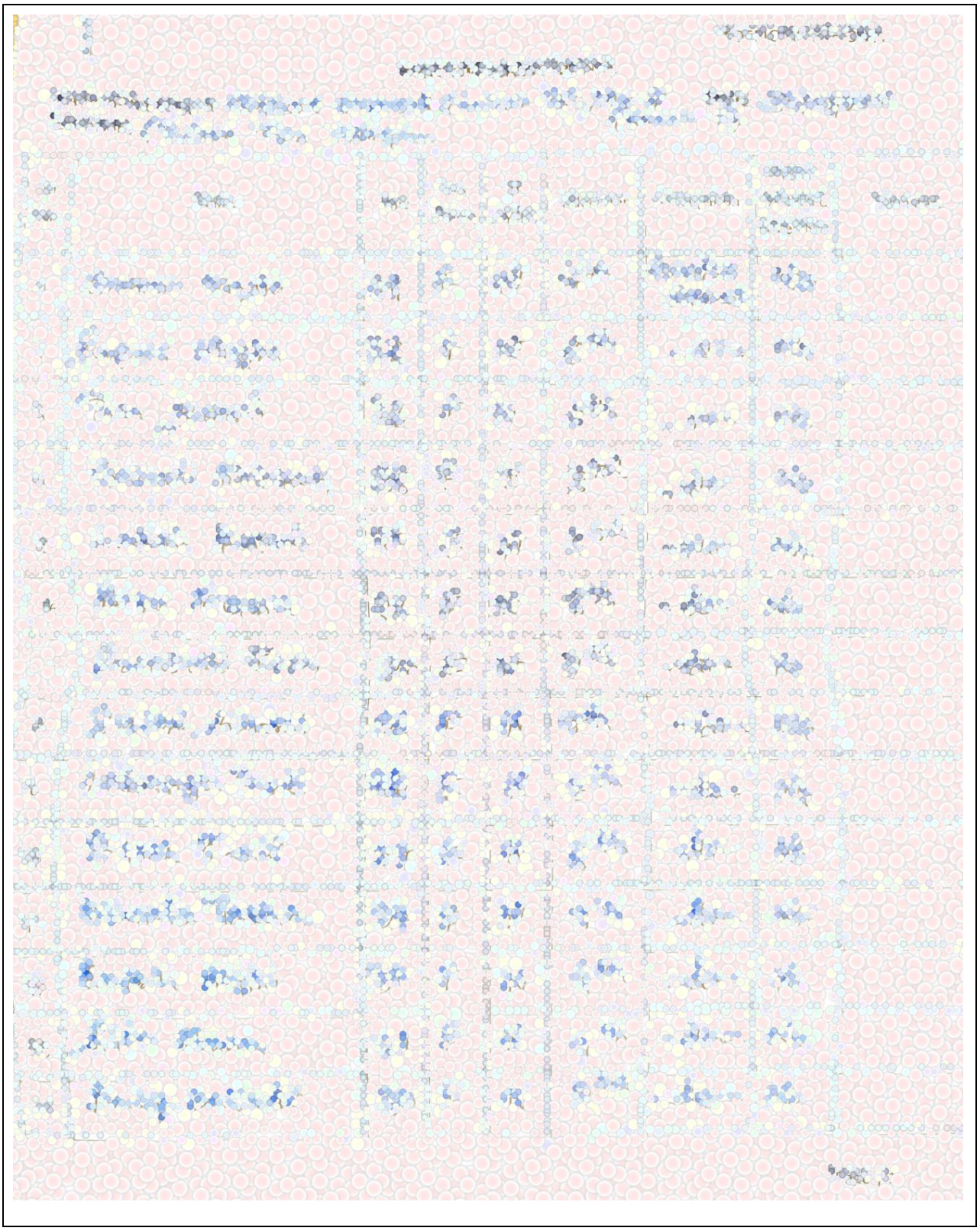


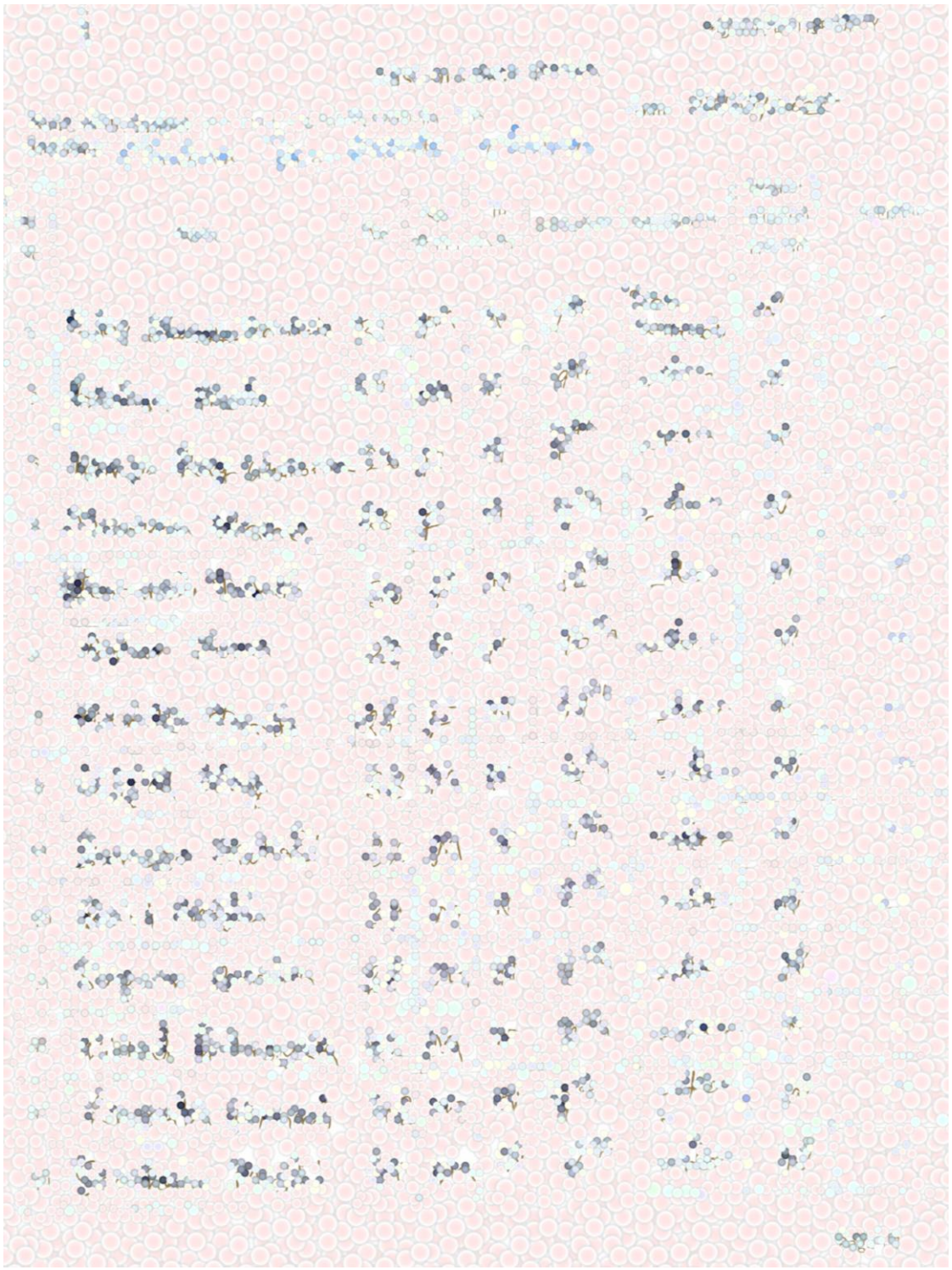


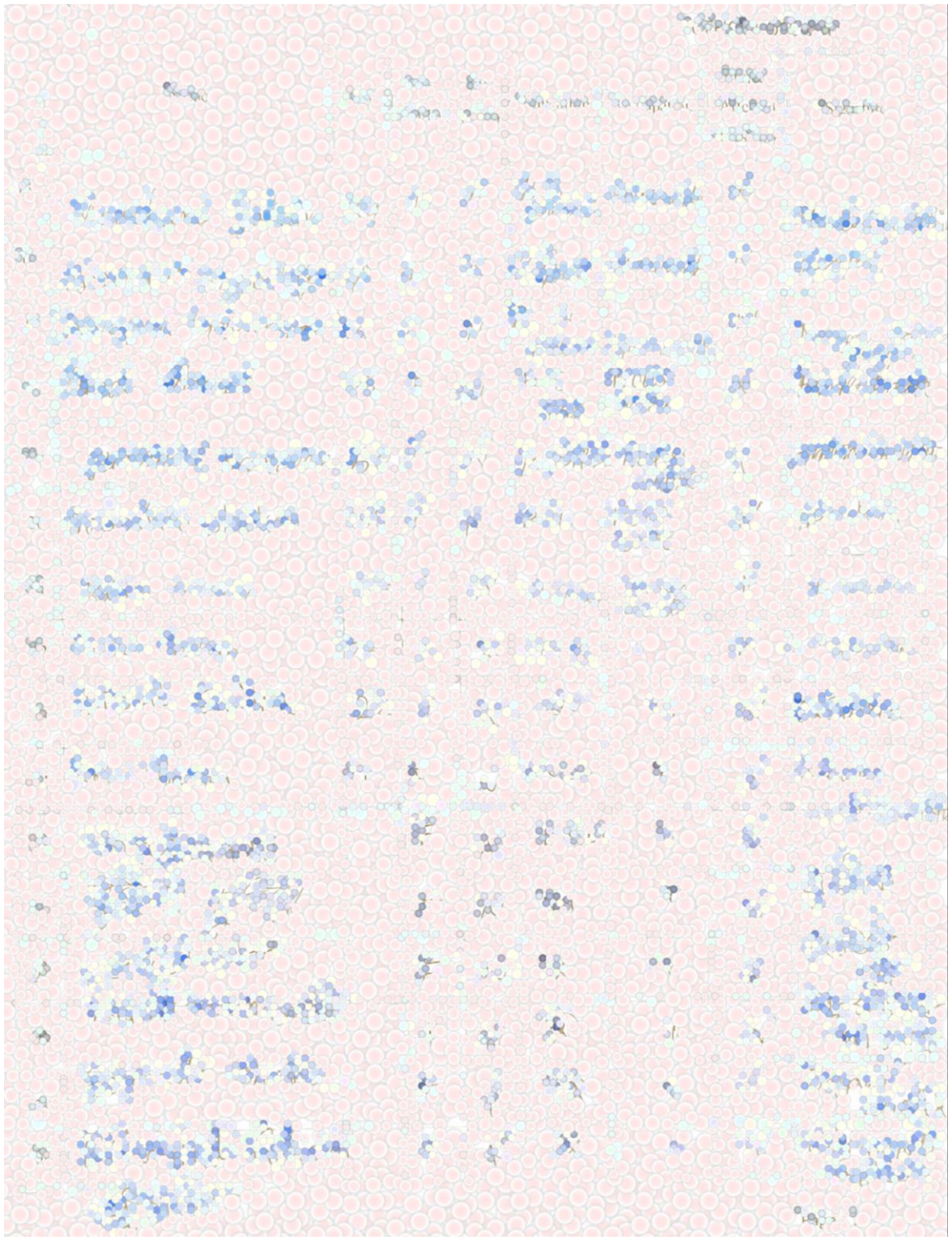


Photographs of public consultation at 132/33kV Titabor GIS site

Appendix 20: Attendance Sheet and Photographs of Public Consultation at 132/33 kV Chabua AIS site



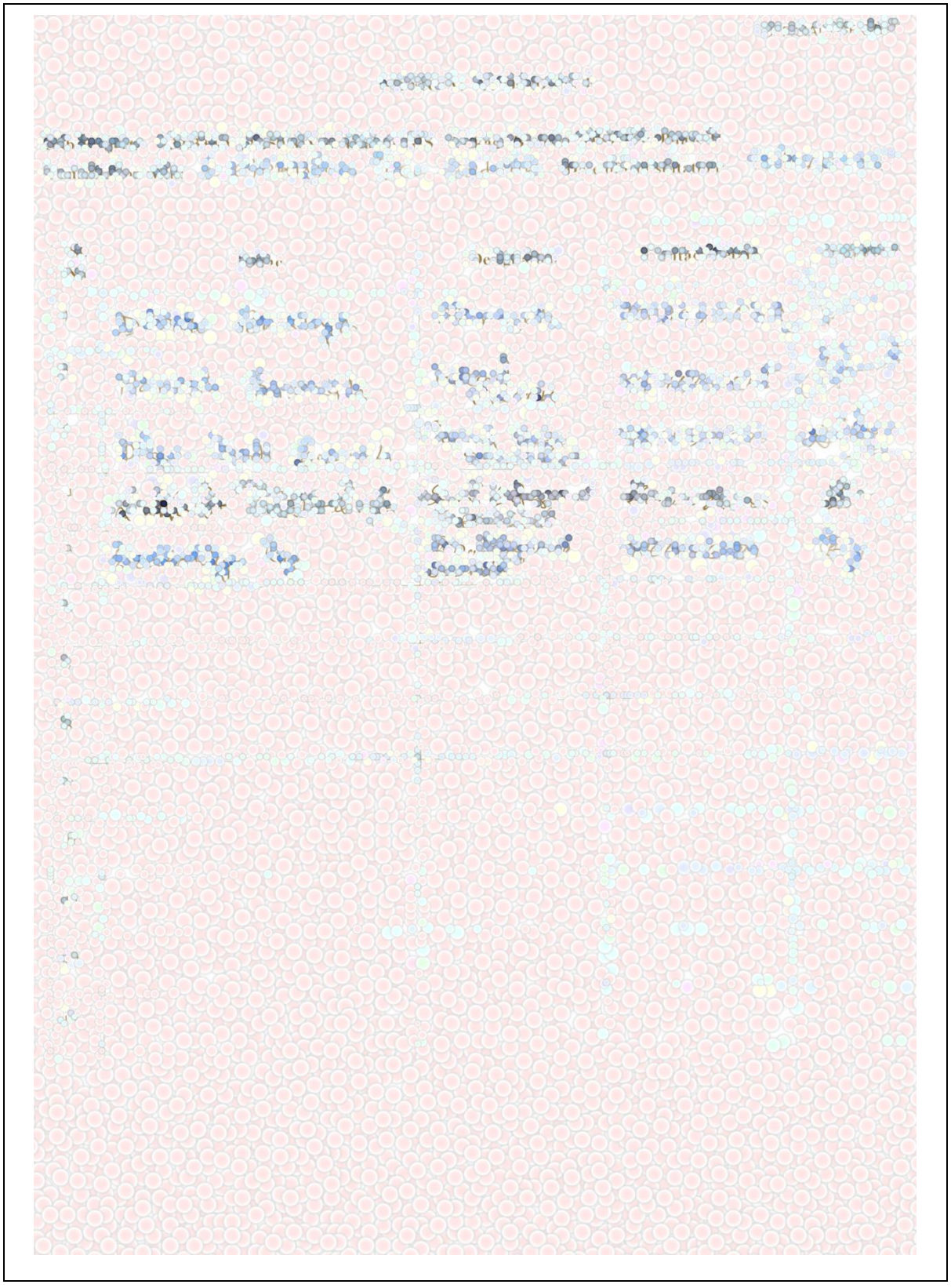


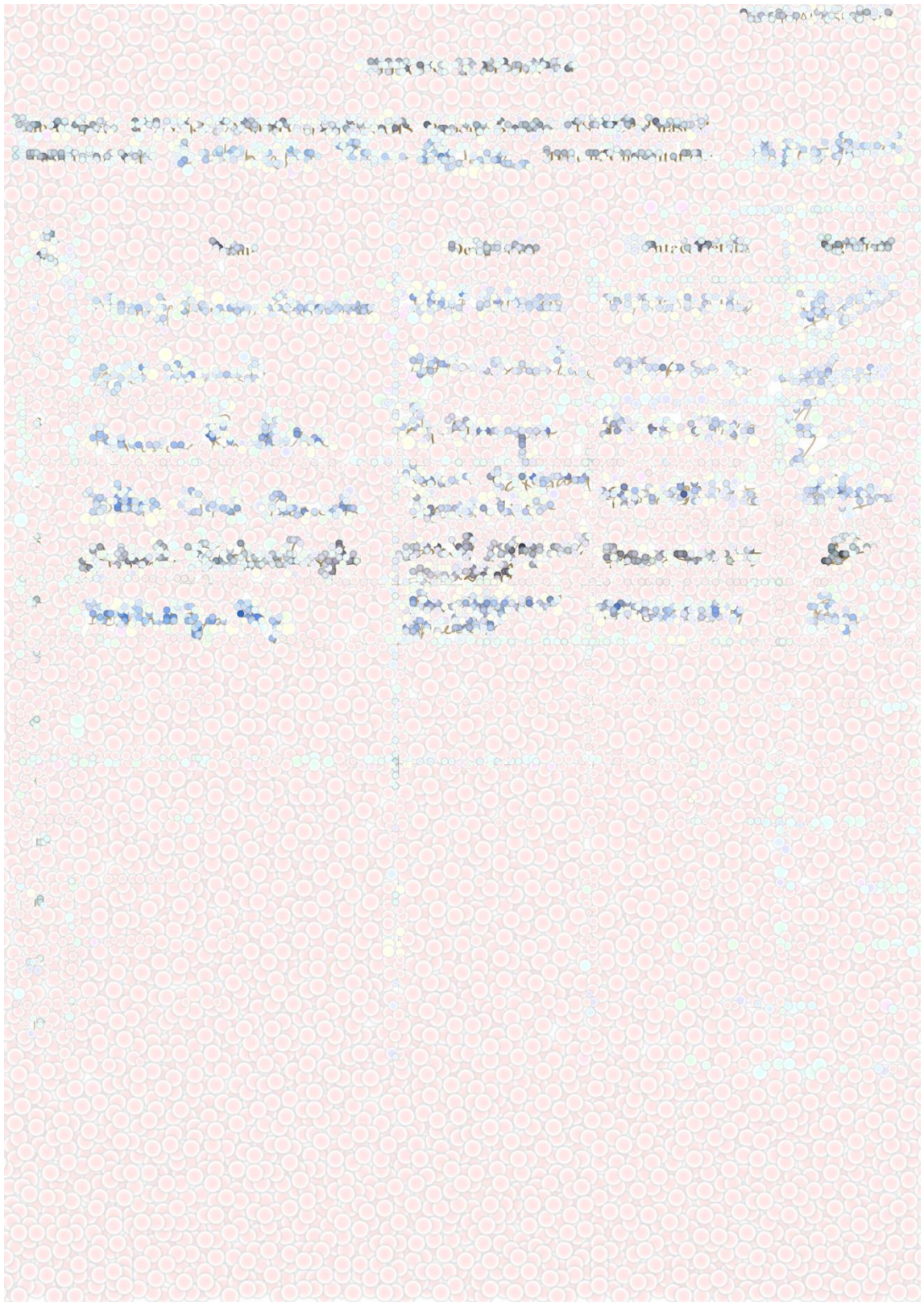


Photographs of public consultation at 132/33kV Chabua AIS site

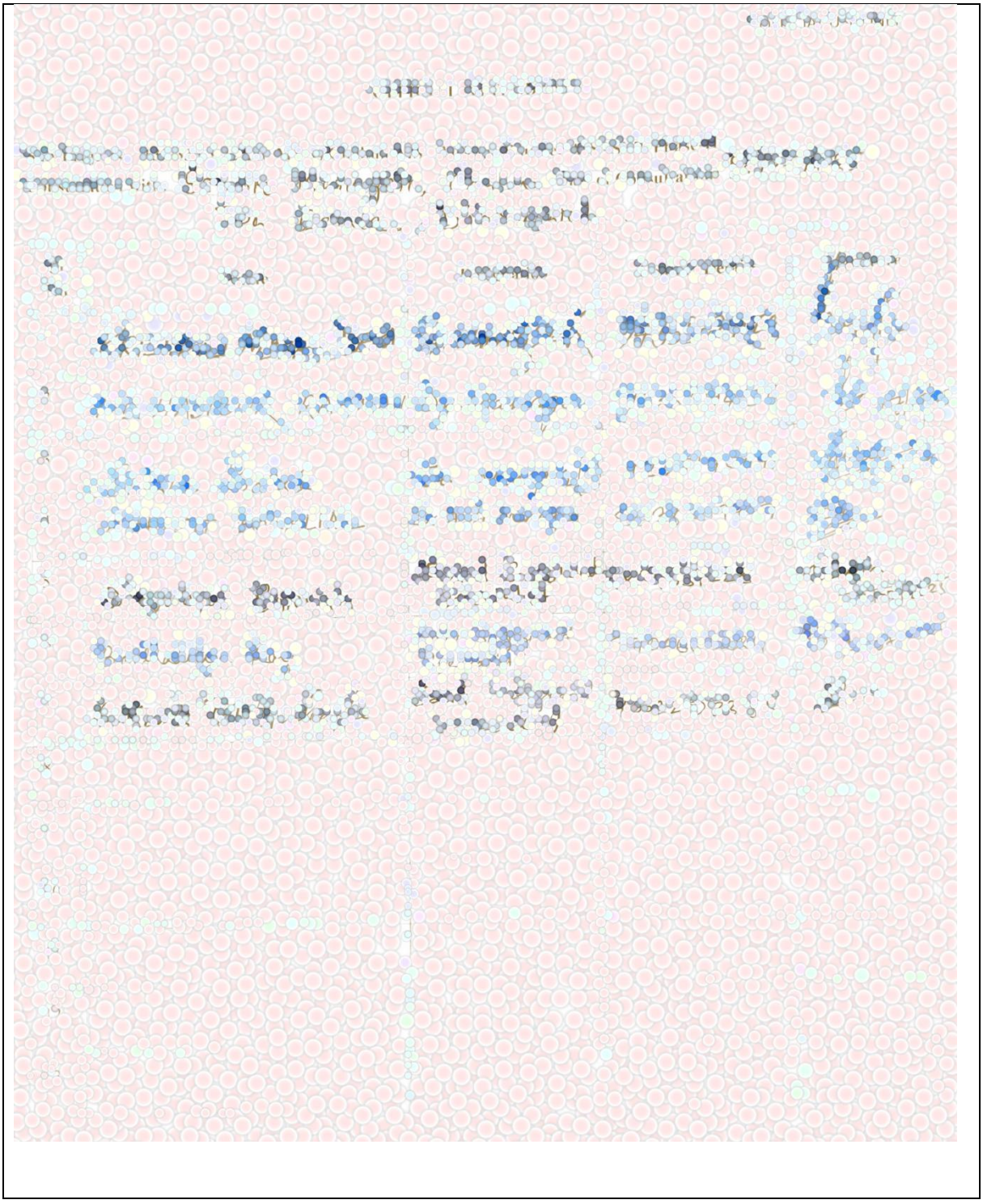
Appendix 21 : Photographs of Stakeholder Consultation with District Revenue & Land Administration (Land Acquisition Branch officials, Jorhat & Chabua Revenue Circle)

Appendix 22 : Attendance Sheet and Photographs of Stakeholder Consultation Tea Garden Authorities of Letekujan Tea Estate.



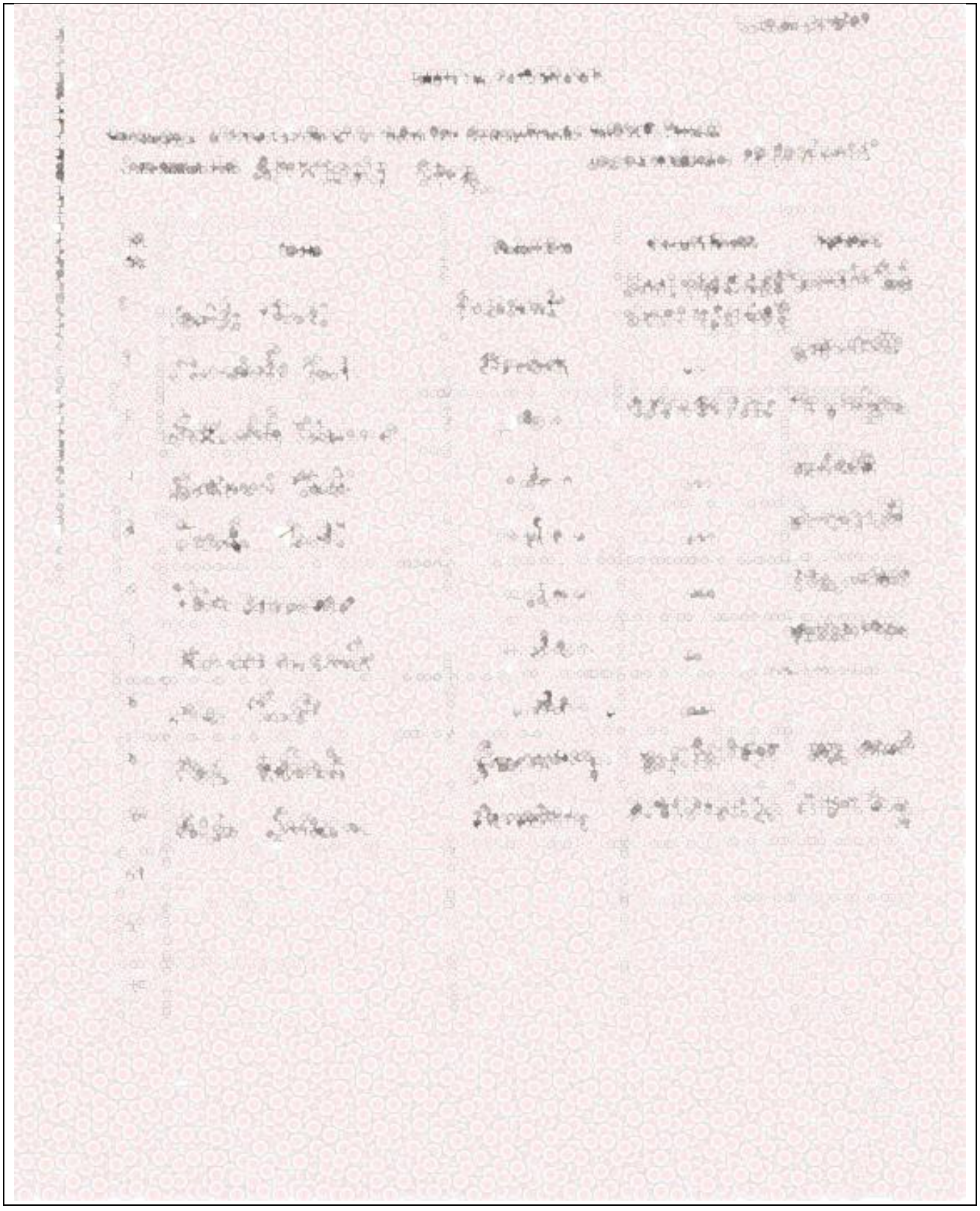


Appendix 23 : Attendance Sheet and Photographs of Stakeholder Consultation Tea Garden Authorities of Chabua Tea Estate.



Galaxy A15 5G

Appendix 24 : Stakeholder consultation with Women SHGs at Titabor



realme
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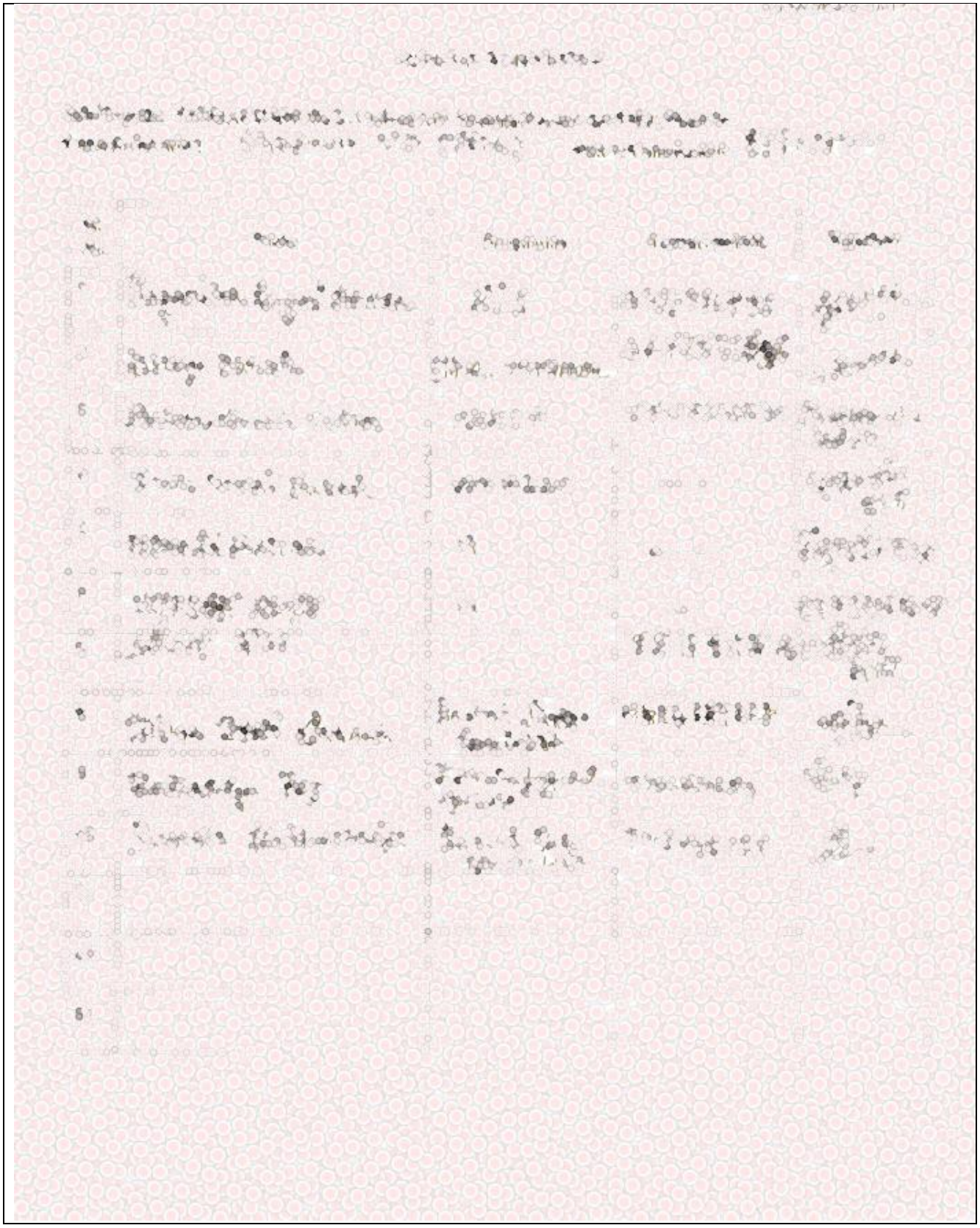
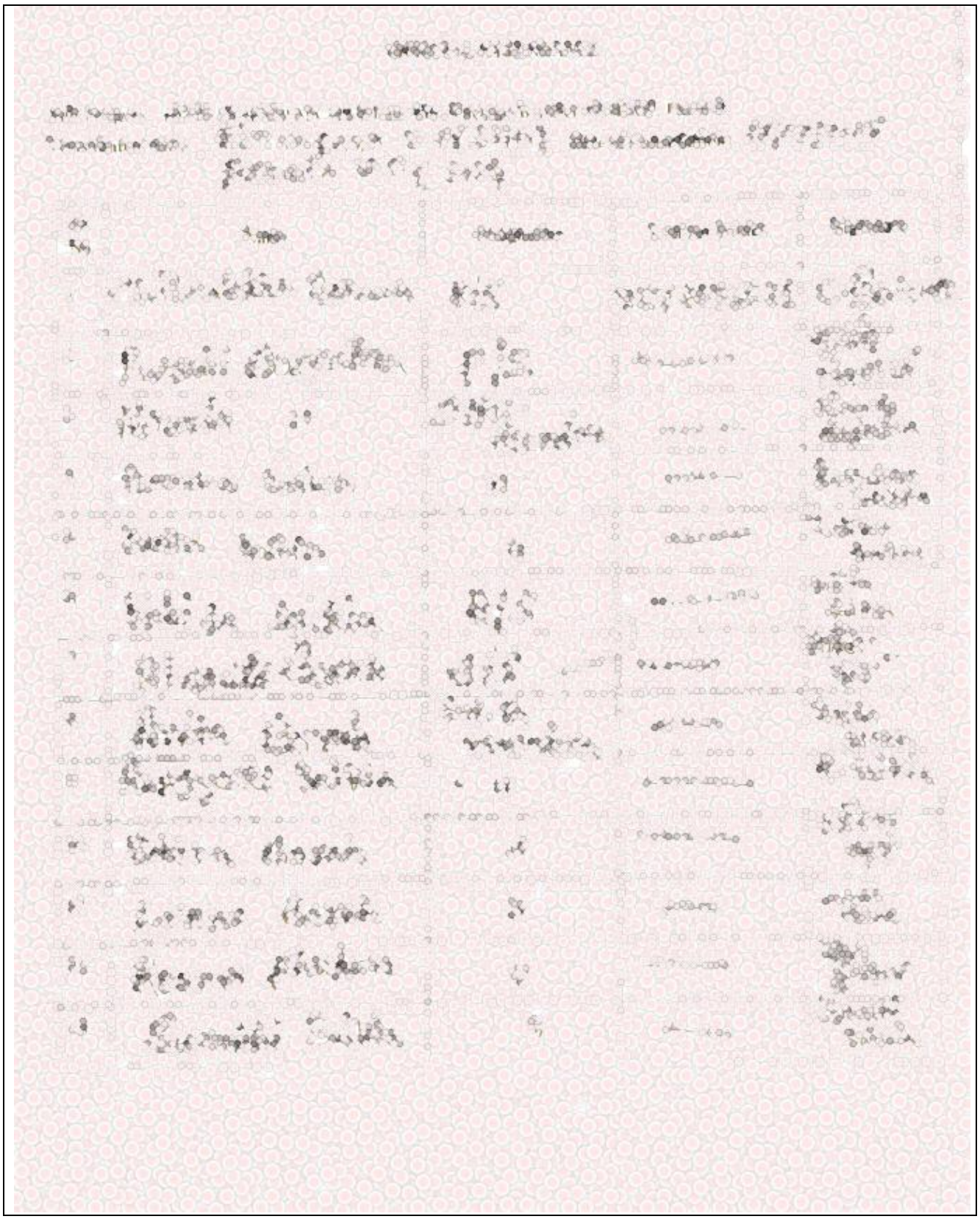
Appendix 25 : Stakeholder consultation with Women SHGs at Chabua





GPS Map Camera
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F5vr+j7f, Mereli Pathar, Assam 786184, India
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Google
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Mereli Pathar, Assam, India
F5vr+j7f, Mereli Pathar, Assam 786184, India
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Google

Appendix 26 : Public Consultation Questionary Format

*OFFICIAL USE ONLY

Public Consultation Format

Site/Location_____

Village_____

District_____

Date of Consultation_____

Consultation conducted by_____

Sl. No.	Consultation Questions	Participants' Opinion, Comments and Suggestions
1	Have you heard about the proposed 220/132 kV GIS Substation project?	
2	Do you support the construction of the substation and related infrastructure in your area?	
3	Do you have any concerns regarding the construction or operation of the substation?	
4	Do you think the selected site for the substation is appropriate and safe?	
5	Would you or someone in your family be interested in job opportunities (skilled/unskilled) during construction?	
6	Do you think local laborers and vendors should be prioritized for employment and business opportunities?	
7	What are the main sources of livelihood in this area? Will the project affect your agricultural or commercial activities?	
8	What is your primary source of drinking water? Do you face any seasonal shortages or water quality issues?	
9	Do you expect any loss of farmland or crops due to this project?	
10	Are you aware that trees will be cut within the substation boundary for construction? Any concerns regarding this?	
11	Do you foresee any potential health or safety risks due to the construction activities?	
12	Are there any protected areas, forests, or ecologically sensitive zones near the proposed project site?	
13	Are there any migratory animals or birds in this area that may be affected by the project?	
14	Do people from this community migrate to other regions for employment? If yes, where and for what jobs?	
15	What benefits do you expect from the project for your household and community?	
16	Do you expect any kind of loss (land, crops, trees, or other) due to this project?	
17	Do you have any suggestions to improve the implementation of the project in your area?	

Appendix 27 : Grievance Register Format

Grievance Register	
Date of Grievance Recorded	
Grievance Recorder	
Grievance submitted through	
Name of Complainant	
Complainant Preferred Contact	
Complainant Address	
Type of Grievance	
Describe Grievance	
Date of Grievance Occurrence	
Date of Acknowledgement	
Mode of Acknowledgement	
Brief Outline of Proposed Resolution	
Action Taken	
Action Taken on	
Outcome	
Outcome communicated to PAH on	
Status Update	
Mode of Complainant Update	
Acknowledged by	
Date Closed	
Days to Close Grievance	
Date of Grievance Received to Tier 2	
Date of GRC meeting (2nd Tier)	
Estimated Time for Resolution	
Action Taken	
Action Taken on	
Outcome	
Outcome communicated to PAH on	
Status Update	
Mode of Complainant Update	
Acknowledged by	
Date Closed	
Days to Close Grievance	