Initial Environmental Examination (Draft)

April 2015

IND: Assam Power Sector Investment Program – Tranche 2

Prepared by Assam Power Distribution Company Limited for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 1 April 2015)

Currency unit	–	Indian rupee/s (Re/Rs)
Rs 1.00	–	$0.0161
$1.00	–	Rs 62.27

ABBREVIATIONS

ADB	–	Asian Development Bank
AEGCL	–	Assam Electricity Grid Corporation Limited
AERC	–	Assam Electricity Regulatory Commission
APGCL	–	Assam Power Generation Corporation Limited
APDCL	–	Assam Power Distribution Company Limited
ASEB	–	Assam State Electricity Board
BIS	–	Bureau of Indian Standards
CEA	–	Central Electricity Authority
CPCB	–	Central Pollution Control Board, Government of India
CGWB	–	Central Ground Water Board
DC or D/C	–	Double Circuit
DPR	–	Detailed Project Report
EA	–	Executing Agency
EARF	–	Environmental Assessment and Review Framework
EHV	–	Extra High Voltage
EIA	–	Environmental Impact Assessment
EMoP	–	Environmental Monitoring Plan
EMP	–	Environmental Management Plan
ESMU	–	Environment and Social Management Unit
FFA	–	Financing Framework Agreement
GHG	–	Greenhouse Gas
GoA	–	Government of Assam
GoI	–	Government of India
GMDA	–	Guwahati Metropolitan Development Authority
GSS	–	Grid Sub-station
GRM	–	Grievance Redress Mechanism
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
MFF	–	Multi-tranche Financing Facility
MOEF	–	Ministry of Environment and Forests, Government of India
PIU	–	Project Implementing Unit
PMU	–	Project Management Unit
PCB	–	Pollution Control Board, Assam
ROW	–	Right of Way
RP	–	Resettlement Plan
SC or S/C	–	Single Circuit
SF_6	–	Sulphur Hexafluoride

WEIGHTS AND MEASURES

ha (hectare)	- 10,000 sq. m = 2.47105 Acre
km (kilometer)	- 1,000 m
kV	- Kilovolt (1,000 volt)
kW	- Kilowatt (1,000 watt)
kWh	- Kilowatt-hour
mG	- milliGauss
MVA	- Megavolt-Amperes
MW	- Megawatt
GWh/MU	- Gigawatt-hour or Million kWh
^{o}C	- degree Celsius

NOTES

(i) The fiscal year (FY) of the Government of India and its agencies begins on 1 April. “FY” before a calendar year denotes the year in which the fiscal year starts, e.g., FY2014 begins on 1 April 2014 and ends on 31 March 2015.

(ii) In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

A. INTRODUCTION

1. The Government of Assam (GoA) through the Government of India (GoI) has requested the Asian Development Bank (ADB) for a Multitranche financing facility (MFF) to fund the power sector investment program in Assam. The Assam Power Sector Investment Program MFF was approved on 3 July 2014 and its Tranche 1 was approved on 11 July 2014.

2. This project will be the Tranche 2 with the total amount of $62 million including counterpart financing of $12 million focusing on the improvement of distribution network system of Assam. The Assam Power Distribution Company Limited (APDCL) is the Executing Agency (EA) and the Implementing Agency (IA) for the Tranche 2.

3. Rural as well as the urban distribution networks of APDCL are faced with several problems that have rendered the delivery of services, efficiency of distribution, and customer service to be poor. Currently, APDCL distribution network system faces i) inadequate coverage of customers and poor service to existing customers; ii) ageing and poorly maintained distribution lines and transformers, which frequently run above their rated capacity, resulting in excessive technical losses and a poor quality of service to customers; and iii) lower quality of customer services owning to the absence of distribution control facilities. This proposed project specifically targets these weaknesses in the distribution system.

B. PROJECT DESCRIPTION

4. The project has two outputs: (i) expansion and up-gradation of the distribution system; and (ii) strengthening institutional capacity of APDCL and APGCL.

5. Expansion of the distribution system include construction of one new substation (33/11 kV), total capacity 10 MVA; construction of additional 4 km of new 33 kV line and 6 km of new 11 kV line for connecting the new substation; construction of 137.5 km of 33 kV line for system strengthening; construction of 11x33 kV terminal bays; construction of 5x33 kV railway track crossing (0.85 km); construction of 1x33 kV river crossing (0.35 km); and construction of 7 km of new 11 kV line for segregation from rural feeder.

6. Up-gradation of the distribution system include refurbishment & modernization (R&M) of 956 km of 33 kV line; R&M of 6x33 kV terminal bays; R&M of 1,000 km of 11 kV line; R&M of 1,555 km of Low Tension (LT) line; replacement of 204 oil-filled distribution transformer (DTR, 11/0.4 kV, 250 kVA) by dry type DTR in busy places as a safety measure; and replacement of 14 km of overhead high tension (HT) and LT line in Guwahati City by underground (UG) cabling.

7. The second output will strengthen institutional capacity of APDCL and APGCL by introduction of IT modules of metering, billing, collection (MBC) application with coverage of 12,00,000 consumers; introduction of Load Dispatch Centre with supervisory control and data acquisition system (SCADA) at Guwahati and Jorhat for better load management; setting up of an Independent Energy Meter Testing Facility to facilitate settling of disputes raised by the consumers; and project implementation consultancy service.

C. ENVIRONMENTAL REQUIREMENTS

8. The Safeguard Policy Statement 2009 (SPS 2009) of ADB sets out the requirements for environmental safeguard that applies to all ADB-financed projects. With ADB funding of the Assam Power Sector Investment Program MFF, an environmental assessment and review framework (EARF) was required to cover the entire investment program and to provide guidance to the EA/IA on compliance to all national environmental laws and regulations, and SPS 2009 for all future tranches under the program. Following this requirement, an EARF was prepared and approved in February 2014 and updated in June 2014. Also under the SPS 2009, Tranche 2 is classified as Category B on environment requiring the preparation of an initial environmental examination (IEE). Based on the requirements of SPS 2009 and EARF, this draft IEE is prepared covering the components of Tranche 2.

9. The Ministry of Environment and Forests (MOEF), GoI, in its notification in September 2006, has exempted transmission projects from environmental clearances due to the non-polluting nature of its activities[1]. This project involves sub-transmission and distribution system which are lower in capacity than a transmission project.

10. According to F. No. 1-9/2007 WL-I (pt) circular of MoEF (9 Feb 2011), Guidelines for Declaration of Eco-Sensitive Zones around National Parks and Wildlife Sanctuaries, "the erection of electrical cables is a regulated activity and not prohibited." Therefore as per eco-sensitive area, the power distribution projects do not fall under prohibited category, but are regulated based on their impacts, that is, if the alignment traverses national parks, areas declared as forest according to Forest Conservation Act 1980, and wildlife sanctuaries. Given this stringent requirement, APDCL ensured that no new lines will traverse any of the mentioned eco-sensitive Areas.

D. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

11. The EARF approved in February 2014 and updated in June 2014 requires that the project under all future tranches must be prepared and designed in compliance with the Framework Financing Agreement (FFA) including ADB's Social Dimensions and Safeguard Requirements set forth in Schedule 5 to the FFA. Selected project components under Tranche 2 meet all the criteria in the EARF and Schedule 4 of the Framework Financing Agreement (FFA).[2]

12. Aside from the requirements of SPS 2009 and EARF, the project components in Tranche 2 also complied with APDCL's selection criteria of optimum site and route alignment. The overall objective is to avoid potential significant adverse environmental impacts, forest areas, and land acquisition. The selected distribution line alignments will generally follow road easements but may traverse agricultural land planted with rice, tea plantations and/or alongside settlements. No re-routing is expected for existing power lines selected for rehabilitation & modernization (R&M) activities. No subproject is located within any areas considered as Critical Habitats[3] and /or Environmentally Sensitive Areas (ESA).[4] No IUCN Level II national park or sanctuary is to be affected by any project activity.[5]

[1] Notification in the Gazette of India, Extra-ordinary part II and section 3, subsection II, 14 September 2006).
[2] http://www.adb.org/projects/documents/assam-power-sector-investment-program-ffa
[3] Critical Habitat (ADB SPS 2009): Critical habitat is a subset of both natural and modified habitat that deserves particular attention. Critical habitat includes areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-

13. The subprojects are not expected to cause significant adverse environmental impacts but may cause temporary impacts during construction such as increased noise and dust levels, vibration, traffic congestion and interference with existing utilities (e.g. power outage, access to pedestrian paths, disruption to water supply, etc.), crop damage during construction and/or during interconnection of distribution lines. These may cause inconvenience to local people on temporary basis. Such impacts and issues such as accumulation of scrap materials/construction debris, increased presence of workers at substation construction site can be readily mitigated by good construction engineering practices, proper planning and adherence with Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) prepared for this project (see **Table 9.1** and **Table 9.2**, Section 9). Up-gradation of distribution system will include dismantling of equipment during R&M activities and replacement of existing oil-filled distribution transformers with dry-type transformers. Scrap material that are still useful and the dismantled DTRs will be stored in the Central warehouses of APDCL located in Guwahati/Jorhat or at the Divisional Stores under each Electrical Circle.[6]

14. The subproject activities such as setting up an independent meter testing laboratory, area load dispatch centers, and IT module for centralized uniform revenue billing system will not have any construction related activities or corresponding environmental impacts.

E. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

15. Initial consultations were done during the site visits held between 5 and 8 September and between 17 and 30 September, 2014. A total of 17 sites were consulted. Consultations with concerned stakeholders / project benefeciares were conducted to gather feedback on the proposed development and pre-ceived socio-economic impacts. The salient features of the consultations are provided in Appendix 4. Meetings and consultations with the relevant Government departments were also carried out to assess the Project approach. Public consultations with project beneficiaries in varying degrees will continue throughout the life of the project.

16. Concerns of local people were common and they include: (i) load shedding or prolonged power outage, voltage drop, fluctuations, and the lack of reliable and stable supply of power affecting their businesses, crop production, livelihood and general day to day affairs. Dispensation of compensation in a timely manner to persons (farmers) affected during construction of substation, erection of the distribution poles and/or stringing of the conductors in

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range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or that are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic, or cultural importance to local communities. Critical habitats include those areas either legally protected or officially proposed for protection, such as areas that meet the criteria of the World Conservation Union classification, the Ramsar List of Wetlands of International Importance, and the United Nations Educational, Scientific, and Cultural Organization's world natural heritage sites.

[4] ESA is a type of designation for an area, which needs special protection because of its landscape, wildlife or historical value.

[5] IUCN protected area management categories classify protected areas according to their management objectives. The categories are recognised by international bodies as the global standard for defining and recording protected areas. Category Ia: Strict Nature Reserve, Category Ib: Wilderness Area, Category II National Park, Category III Natural Monument or Feature, Category IV: Habitat/Species Management Area, Category V: Protected Landscape/ Seascape, Category VI: Protected area with sustainable use of natural resources

[6] Electrical Circle (EC) implies distribution coverage for a given district. There are a total of 27 districts and 20 EC. Most ECs cover one district while the following EC such as Cacchar, Boningaon, Barpeta, KANCH, and Lakshimpur cover at least two districts..

the past, was not a concern. Overall, the concerned local people were aware of the proposed project and were supportive due to expected benefits i.e. availability of a reliable power supply.

17. This draft IEE will be posted to ADB website as required by SPS 2009 and Public Communications Policy 2011. A project factsheet or a frequently asked questions flyer in Assamese and Hindi will be made available at the APDCL field offices. Aside from this public disclosure requirement of the ADB, the Right to Information Act (2005) of GoI also provides for additional obligation for APDCL to provide information about the project.

F. IMPLEMENTATION ARRANGEMENTS

18. The key institutions involved in the environmental management and monitoring process for subprojects will be the Project Management Unit (PMU) and the Project Implementation Unit (PIU) of APDCL.

19. The PMU will be responsible for the overall project management and overseeing sub-project compliance with environmental and social safeguard requirements while the Environmental and Social Management Unit (ESMU)[7] in tandem with the PIU and field offices will have primary responsibility for the environmental assessment and implementation of EMP and oversight of the Engineering, Procurement, and Construction (EPC) Contractor(s) or third party consultants.

20. The ESMU is responsible for the overall assessment and implementation of the EMP while supported by the PIU and field offices. At the minimum the ESMU functions will include i) oversight of field offices and EPC Contractor(s) for monitoring and implementing mitigation measures; (ii) liaising with the field offices and EPC Contractor(s) to solve any environmental related issues with subproject implementation; and (iii) in preparing the environmental monitoring reports every 6 months (for review and submission as required by the ADB).

21. APDCL may hire an Environment and /or Social Consultant(s) at PIU level to assist ESMU in day-to-day coordination and reporting for various subproject activities. The hired consultant will also coordinate and interact with the PMU on compliance to ADB requirements, relevant government agencies and local authorities on clearances (as needed), update and finalize the draft IEE, as needed, and will prepare the environment section of the Project's Quarterly Progress Report (QPR) submitted to the PMU for review. The environment section in the Project's QPR will be summarized by the PMU and submitted as Environmental Monitoring reports to ADB on a semi-annual basis during construction. The semi-annual environmental monitoring reports are posted to ADB's website.

22. The ESMU and PIU will ensure that the EPC Contractor(s) will be informed of their responsibility to comply with the EMP and the requirements of ADB. There are specific responsibilities for EPC Contractor(s) on EMP compliance during the construction phase. The EPC Contractor(s) work plan will be monitored by the ESMU and PIU, with overall management and compliance supervised by the PMU. The EPC Contractor(s) will be requested to submit a monthly progress reports on the implementation of the EMP measures to ESMU, which will form part of the QPR.

[7] ESMU is responsible for environment, resettlement, and any other social development obligations and will function under PMU and PIU of APDCL.

23. During operation stage, the PMU and PIU will designate a staff who will be responsible to deal with environmental issues and compliance to ADB's environmental requirements such as submission of the environmental monitoring report annually, including compliance to the EARF provisions[8], and in coordinating with complaints and/or grievances filed through the Grievance Redress Mechanism (GRM), if any. The designated staff will have training on ADB's requirements.

G. GRIEVANCE REDRESS MECHANISM

24. A grievance redress mechanism will be established by the PMU to deal with complaint(s) from affected persons (APs) during implementation. APs can seek redress of their grievance at three levels: (i) the PMU/PIU, (ii) the grievance redress committee (GRC), and (iii) the appropriate courts of law. GRC is set up by the PMU as soon as the project commences and will function as such from construction to operation. The PMU will ensure the representation of women on the members of GRC which will consist of representatives from the local Panchayat, a District revenue officer/ Sub-district magistrate or their nominee, representative from the EPC Contractor(s) during construction phase only, Assistant General Manager (AGM) of ESMU, Project Head, PMU, and a witness of the Affected Person (AP).

H. CONCLUSIONS AND RECOMMENDATIONS

25. The subprojects were selected following the provisions of EARF, FFA as well as APDCL's criteria for selection of optimum site and route alignment and employing appropriate survey methods to avoid potential significant adverse environmental impacts, forests, Critical Habitats, ESA, and land acquisition. No IUCN Level II national park or sanctuary will be affected by any project activity.

26. Distribution line alignment (new 33 kV and 11 kV lines) will generally follow road easements but will traverse primarily agricultural lands planted to rice and tea plantations (mainly in the Upper Assam Region (UAR)).

27. All the subprojects are not expected to cause significant adverse environmental impacts during construction and operation. However, vegetation clearing within the right-of-way (ROW) will be required which can be easily mitigated by proper planning, consultation, and best practices in construction engineering. Replanting with native species will be done after completion of civil works. Mitigation measures are included in the EMP and parameters for monitoring have been identified in the EMoP.

28. Consultations of local people were done as part of preliminary surveys and environmental assessment in September 2014. Concerns were common and they include: (i) load shedding or prolonged power outage, voltage drop, fluctuations, and the lack of reliable and stable supply of power affecting their businesses, crop production, livelihood and general day to day affairs. Overall, the concerned local people were aware of the proposed project and were supportive due to expected benefits i.e. availability of a reliable power supply as well as employment opportunities resulting from the project. Consultations will continue throughout the life of the project.

[8] EARF provisions, February 2014: (i) sub-project selection taking into account environmental screening criteria; (ii) sub-project environmental assessments prepared in accordance with the requirements set out in this EARF; (iii) appropriate public consultations and disclosures; (iv) effective management of the grievance redress mechanism; and (v) EARF compliance reported in the environmental monitoring report.

29. A grievance redress mechanism will be set up by the PMU to properly address complaints and issues that may arise from affected persons during implementation.

30. This draft IEE will be publicly disclosed at the ADB website as required by SPS 2009 and Public Communications Policy 2011. A project brief and/or factsheet will be prepared in Assamese and Hindi, and made available to the public at the PMU field offices and local village *panchayat*.

31. The reliability and stability of power supply resulting from the project is expected to improve the quality of life and the pace of economic development in Assam.

1. INTRODUCTION

1.1 Project Scope

1. Rural as well as urban distribution networks of APDCL are faced with several problems, causing the delivery of services, efficiency of distribution and customer service to be poor. Currently, APDCL distribution network systems face: i) inadequate coverage of customers and poor service to existing customers; ii) ageing and poorly maintained distribution lines and transformers, which are frequently run above their rated capacity, causing excessive technical losses and a poor quality of service to the customers; and iii) lower quality of customer services owning to the absence of distribution control facilities. Tranche 2 targets these weaknesses to improve efficiency and reliability of the distribution systems.

1.1.1 Impact and Outcome

2. The Project's impact will be enhanced quality and expanded service delivery of electricity in Assam. The outcome of the project will be increased efficiency and capacity of power distribution system in Assam.

1.1.2 Output

3. The project has two outputs: (i) expansion and up-gradation of the distribution system; and (ii) strengthening institutional capacity of APDCL and APGCL.

Output 1: Expansion and up-gradation of the distribution system includes:

(i) construction of one new 33 kV/11kV substation, install the associated terminal equipment, and associated 33 kV lines (4 km) and 11 kV (6 km);
(ii) construction of 137.5 km of 33 kV lines;
(iii) construction of 33 kV railway line and river crossing;
(iv) construction of eleven (11) new 33 kV bays at existing 33kV/11kV substations; and
(v) construction of 7 km of 11 kV lines for the segregation of the rural and agricultural feeders.
(vi) re-conductoring/refurbishment of 956 km of 33 kV lines;
(vii) rehabilitation and renovation of six (6) 33 kV bays at existing 33 kV/11kV substations;
(viii) re-conductoring/refurbishment of 1000 km of 11 kV lines;
(ix) re-conductoring/refurbishment 1555 km of LT lines;
(x) replacement of 204 existing oil-filled distribution transformers with dry-type transformers; and
(xi) replacement of existing 14 km of overhead 11 kV & LT line with underground cable.

Output 3: Strengthening institutional capacity of APDCL and APGCL includes:

(i) setting up of one (1) independent meter testing laboratory;
(ii) establishing one (1) IT module for the introduction of centralized uniform revenue billing system for all consumers;
(iii) establishing two (2) area load dispatch centers; and.
(iv) project implementation consultancy service.

4. **Appendix 1** presents the project components across the State namely in Upper Assam Region (UAR), Central Assam Region (CAR), and Lower Assam Region (LAR).

1.1.3 Investment Plan

5. The overall investment plan is presented in **Table 1.1.**

Table 1.1 Investment Plan[9]

Modality and Source	**Amount** ($ million)
Asian Development Bank Sovereign MMF Tranche (loan): Ordinary Capital Resources	50.00
Government	12.00
GRAND TOTAL	**62.00**

1.2 The Need for Initial Environmental Examination

1.2.1 National and State Level Requirements

6. GoI considers power transmission and distribution projects as environment-friendly compared with other power development projects, since they do not generate and dispose of hazardous waste to land, air, and water, thus, they are not included within the realm of the Environment Protection Act 1986. In September 2006, the Ministry of Environment and Forests (MOEF) has issued a notification exempting power transmission and distribution projects from environmental clearances due to its non-polluting nature.[10] Therefore, no environmental clearances for the project will be required from the MOEF or at the State-level Environment Impact Assessment Authority.

7. Under the Forest Conservation Act (1980), if power transmission or distribution projects will traverse or affect land classified as forest by GoI, forest clearance has to be obtained from the relevant authorities to prevent deforestation and degradation. In such a case, guidance on right-of-way (ROW) and tree cutting will be followed (see **Appendix 2** for details). The Assam State government cannot de-classify any forest land or authorize its use to any non-forest purpose without the approval of the Central government.[11] Given this stringent requirement, avoidance of land designated as forest by GoI has been included as one of the main criteria for site selection in this project to ensure that no forest clearance for the subprojects will be required.

8. The F. No. 1-9/2007 WL-I (pt) Circular of MoEF (9 February 2011) provides guidelines for Declaration of Eco-Sensitive Zones around National Parks and Wildlife Sanctuaries. The guidelines suggest that, “the erection of electrical cables is considered a regulated activity and not prohibited.” Following this provision, power distribution projects do not fall under the prohibited category but are regulated due to its potential environmental impacts, that is, if the alignment traverses national parks, areas declared as forest according to Forest Conservation

[9] Source: Report and Recommendation of the President to the Board of Directors, Project No. 47101 June 2014
[10] Notification in the Gazette of India, Extra-ordinary part II and section 3, subsection II, 14 September 2006.
[11] In line with the national GoI, GoA manages their forest resources pursuant to the Forest Act (1980), which provides for the mechanism to protect its rich forests, biodiversity and natural heritage and resources. The Act permits only unavoidable use of forestland for various development purposes. The Forest Act is regulatory in nature and not prohibitory and provides a built-in mitigation process for cases where forest access is unavoidable.

Act (1980), and wildlife sanctuaries. Given this stringent requirement, APDCL ensured that no new lines will traverse any of the mentioned eco-sensitive Areas.

1.2.2 Requirements of ADB

9. The Safeguard Policy Statement 2009 (SPS 2009) of ADB sets out the requirements for environmental safeguard that applies to all ADB financed projects.[12] Under SPS 2009, projects that require financing from ADB are screened and categorized based on their potential environmental impacts.

10. The EARF for Assam Power Sector Investment Program approved on February 2014 is applicable to all investments funded by the MFF particularly to projects included in any subsequent tranches which have not yet been fully defined. The EARF guides the project proponent to comply with all national environmental laws and regulations and SPS 2009 for all future tranches under the program. The EARF provisions include: (i) sub-project selection taking into account environmental screening criteria; (ii) sub-project environmental assessments prepared in accordance with the requirements set out in this EARF; (iii) appropriate public consultations and disclosures; (iv) effective management of the grievance redress mechanism; and (v) EARF compliance reported in the environmental monitoring report.

11. According to SPS 2009, Tranche 2 is Category B and following the EARF, an IEE was prepared.

1.2.3 Objectives of the IEE

12. The objectives in undertaking an IEE are:

i. To assess the environmental impacts – positive and negative associated with the proposed project;
ii. To identify the corresponding mitigation and/or enhancement measures for the environmental impacts; and,
iii. To ensure that all statutory requirements for the project such as applicable rules and regulations, clearances required (if any), etc. have been considered to ensure compliance.

1.2.4 Scope and Methodology

13. The scope of the IEE covers the general environmental profile of Assam, an assessment of the potential environmental impacts on physical, ecological, economic, and social and cultural resources within the project's influence area during design and pre-construction, construction, and operation stages. An EMP and EMoP are integral part of the IEE. The IEE followed a number of steps:

i. Conduct field visits to collect primary or secondary data relevant to the project area to establish the baseline environmental condition and also collect project data from the Detailed Project Report (DPR) prepared by the APDCL in September 2014;

[12] Asian Development Bank Safeguard Policy Statement (SPS 2009); http://www.adb.org/documents/safeguard-policy-statement
(accessed October 2014)

ii. Assess the potential impacts on environmental attributes due to the location, design, construction and operation of the project through field investigations and data analysis;

iii. Explore opportunities for environmental enhancement and identify measures;

iv. Prepare an outlining the measures for mitigating the impacts identified and corresponding environmental monitoring viz-a-viz an EMoP;

v. Identify the institutional arrangements for implementing and compliance with the above plans;

vi. Identify critical environmental parameters required to be monitored subsequent to the implementation of the project;

vii. Compare the environmental safeguard requirements of GoI and ADB, and identify measures to bridge the gap, if any;

viii. Carry out consultation with affected stakeholders, local administrative bodies to identify perception of the project, introduce project components and anticipated impacts; and

ix. Disclose the draft IEE at ADB website and prepare project brief and/or FAQs in Assamese and Hindi to be made publicly available at the office of APDCL and field offices in project affected areas.

14. Field visits were done between 5 and 8 September 2014 and another between 17 and 30 September 2014. The objective of the field visits was to conduct ocular inspection of proposed sites and to assess the existing condition of its physical and biological environment, consult with local people who may be potentially affected by the subprojects, coordinate with local authorities for additional information, and to conduct secondary data collection.

1.3 Structure of the Report

15. In line with ADB SPS 2009, the IEE report has the following contents:

Section No.	Content	Description
	Executive Summary	Briefly describes the critical facts, significant findings, and recommended actions.
1	Introduction	Describes the overview of the project, environmental requirements, objectives and scope of the study, approach and methodology.
2	Policy, Legal, and Administrative Framework	Discusses the National and State level legal and institutional framework within which the environmental assessment is carried out; Identifies project-relevant international environmental agreements to which the GoI is a party or signatory, and other requirements relevant to the proposed project such as no objection certificate, consent/permission from concerned departments and/or organizations, as applicable.
3	Description of the Project	Provides an overview of the proposed project; its

Section No.	Content	Description
		objectives and major components including maps showing the project's location.
4	Description of the Environment	Describes the relevant physical, biological, and socioeconomic conditions within Assam as the subprojects covered in the proposed project are spread all over the State.
5	Anticipated Environmental Impacts and Mitigation Measures	Examines anticipated environmental impacts due to proposed project sites and lists measures to ensure avoidance of significant adverse environmental impacts
6	Analysis of Alternatives	Examines the alternatives to proposed project sites, approach for route selection
7	Information Disclosure, Consultation, And Participation	Describes the process of engaging stakeholders and information disclosure.
8	Grievance Redress Mechanism	Describes the grievance redress framework and setting out the time frame and mechanisms for resolving potential complaints and/or issues from affected persons
9	Environmental Management Plan and Environmental Monitoring Plan	The environmental impacts, mitigation measures including the environmental monitoring are summarized in the EMP and EMoP. The plans describes the set of mitigation, management, and monitoring measures to be taken for each identified environmental impact during project design, construction and operation.
10	Conclusion and Recommendations	

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 ADB Safeguard Policy Statement (SPS) 2009

16. ADB requires consideration of environmental issues in all aspects of its operations and the requirements for mainstreaming environmental safeguard are embodied in SPS 2009. SPS 2009 applies to all projects that require financing from ADB.

17. **Screening and Categorization**: Under SPS 2009, projects are screened and categorized based on their potential environmental impacts. The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are assigned to one of the following four categories:

i. **Category A**. Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.

ii. **Category B**. Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required.

iii. **Category C**. Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.

iv. **Category FI**. Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

18. **Environmental Management Plan**: An EMP that addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project‘s impact and risks.

19. **Public Disclosure**: The IEE will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into the local language for the project-affected people and other stakeholders. ADB will post the following safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation.

2.2 Applicable National and State Legislation

20. The implementation of the project will be governed by the GoI and GoA environmental acts, rules, regulations, and standards. Pollution Control Board, Assam (PCBA) is the government agency tasked to ensure that environmental clearances and environmental

standards are complied with during project implementation.[13] These regulations impose restrictions on project activities to minimize and/or mitigate likely impacts on the environment. It is the responsibility of APDCL to ensure that the subprojects are consistent with the policy, legal and administrative framework across all hierarchy - National, State, Municipal and local.

21. The GoI have structured a number of policies that may be relevant to Tranche 2. **Table 2.1** presents some of the key policies relevant to the subproject activities (see **Appendix 2** for the list of applicable environmental laws, regulation and standards including national and state policies). Compliance to these acts and regulations is mandatory.

Table 2.1 Indian Policies related to Power Transmission and Distribution Projects

S. No.	Name of Regulation	Applicability
1	National Forest Policy, 1988	Yes
2	National Environmental Policy 2006	Yes
3	Wildlife Conservation Strategy 2002	Yes
4	National Policy for Resettlement and Rehabilitation 2007	Yes

2.2.1 Clearance under the Forest (Conservation) Act 1980

22. Guidelines for diversion of forest land for non-forest purposes under the Forest (Conservation) Act, 1980 suggest that where routing of distribution lines through the forest areas cannot be avoided, these should be aligned in such a way that it involves the least amount of tree cutting. Below each conductor, a width clearance of 3 meters (m) would be permitted for the movement of tension stringing equipment. The trees on such strips would have to be felled but after stringing work is completed, the natural vegetation will be allowed to regenerate. Felling/pollarding/pruning of trees will be done with the permission of the local forest officer whenever necessary to maintain the electrical clearance. One outer strip shall be left clear to permit maintenance of the power line. Pruning of trees for taking construction/stringing equipment through existing approach/access routes in forest areas shall also be permitted to the extent necessary/ as may be decided by local forest officer. Construction of new approach/ access route will however, require prior approval under the Act. In case of transmission lines passing through National Parks, Wildlife Sanctuaries and Wildlife Corridors, insulated conductors shall only be used to prevent electrocution of animals.[14]

2.2.2 National and State Environmental Assessment Requirements

23. As per Environment Impact Assessment (EIA) Notification 2006 of GoI, power transmission and distribution projects are not listed as environmentally sensitive projects and hence, no environmental clearance is required from the MOEF or from the State-level Environment Impact Assessment Authority. Clearance from the Assam Forest Department is required only in cases where a subproject is constructed on forestland or requires cutting of

[13] Pollution Control Board of Assam; http://www.pcbassam.org/consent.htm

[14] Source: F. No.7-2s/ 29I2-FC, MOEF, GOI:Guidelines for diversion of forest land for non-forest purposes under the Forest (Conservation) Act, 1980 / Guidelines for laying transmission lines tluough forest Areas, May 2014.

forest trees.[15] **Figure 2.1** shows the process of obtaining an environmental clearance in India corresponding to the category of the project.

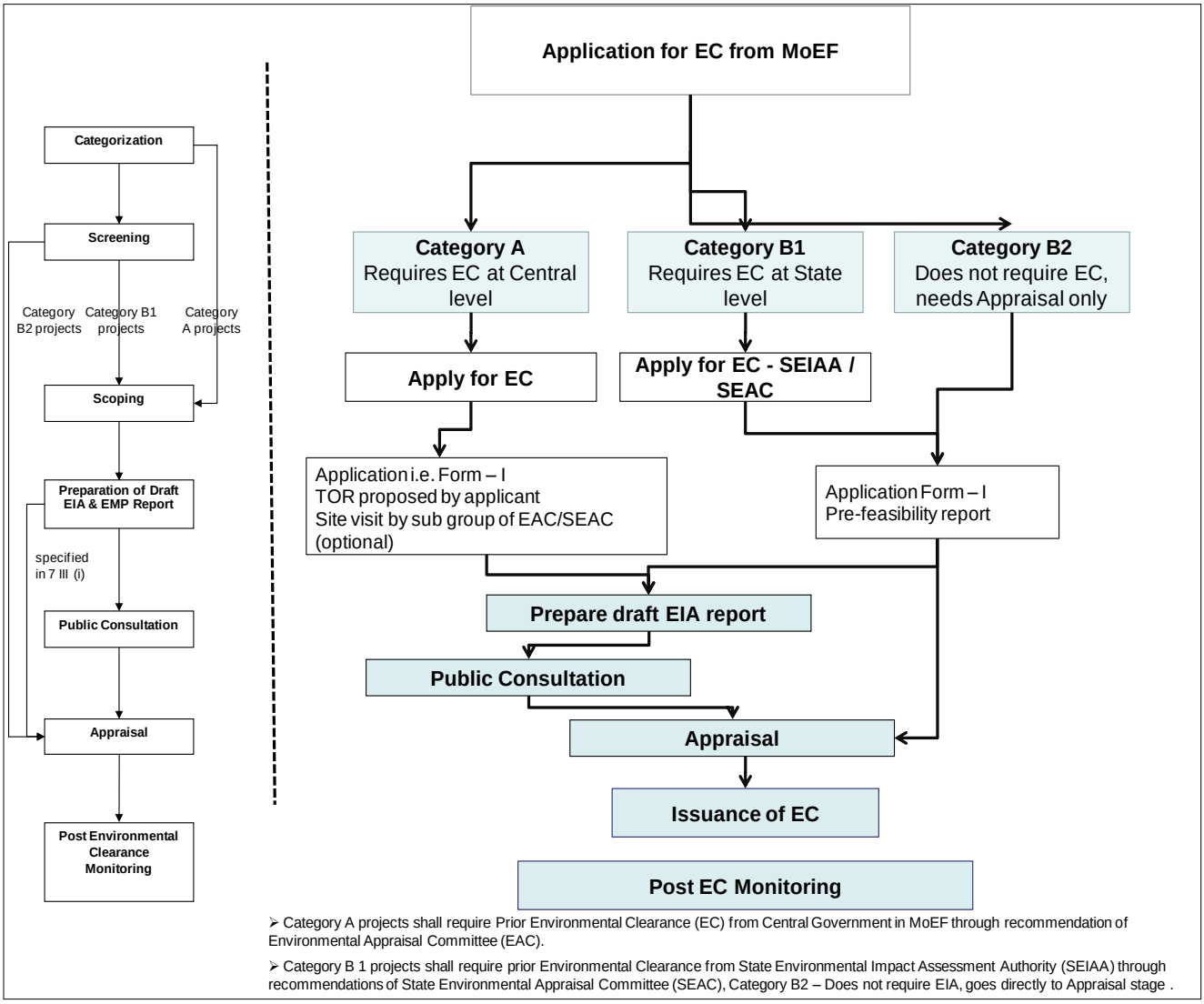


Figure 2.1: Environmental Clearance Process in India

2.3 Comparison of Environmental Requirements of ADB and GoI

24. **Table 2.2** presents a comparison of the environmental requirements of ADB and GoI, and addresses gaps in requirement, if any.

[15] Assam Forest Department; http://assamforest.in/common/

Table 2.2 Comparison of Environmental Requirements of ADB and GoI

S.No	ADB	GoI	Gaps
1.	Screening and Categorization		
	Uses sector-specific rapid environmental assessment checklist for screening Assigns categories based on potential impacts: - Category A - EIA required (irreversible, diverse or unprecedented adverse environmental impacts) - Category B - IEE required - Category C - no environmental assessment required but a review of environmental implications is required - Category FI -	EIA Notification (2006; 2009) set screening criteria to classify new and expansion projects based on potential environmental impacts as follows: Category A, B1 and/or B2.[16] The category determines the level of environmental assessment.	As per the Indian regulations, the environment impact assessment (EIA) is *mandatory* for eight types of project activities including mining, power generation, primary processing, materials production and processing, specific manufacturing and services sectors, infrastructure and construction. Under each category, the threshold limits are specified when it is mandatory to conduct an EIA. Power transmission (and distribution) projects are not listed as environmentally sensitive projects.

[16] Under the Environment Impact Assessment (EIA) Notification 2009 of GoI, the environmental classification of projects is determined by MoEF, GoI and there are two possible outcomes:

- **Category A**: A project or activity is classified as Category A if it is likely to have significant negative impacts and is thus one of the types of project listed in this category in the EIA Notification. Such projects require EIA, plus Environmental Clearance (EC) from MoEF; and
- **Category B**: A project or activity is classified as Category B if it is likely to have fewer negative impacts and is listed in this category in the EIA Notification. These projects require EC from the State Environment Impact Assessment Authority (SEIAA), who classify the project as B1 (requiring EIA) or B2 (not requiring EIA), depending on the level of potential impacts. Projects classified as B2 require no further study.

As per EIA Act 2009, the General Condition notes that "Any project or activity specified in Category 'B' will be treated as Category 'A', if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972; (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time; (iii) Eco-sensitive areas, as notified under section 3 of the Environment (Protection) Act, 1986, such as Mahabaleshwar, Pancgani, Matheran, Panchmarhi, Dhanu, Doon valley, and (iv) Inter-State boundaries and international boundaries".

Furthermore, according to F. No. 1-9/2007 WL-I (pt) circular of MoEF (9 Feb 2011), Guidelines for Declaration of Eco-Sensitive Zones around National Parks and Wildlife Sanctuaries, "the erection of electrical cables is a regulated activity and not prohibited."

S.No	ADB	GoI	Gaps
	ESMS required		
2.	Environmental Assessment		
	Identify potential impacts on physical, biological, physical cultural resources, and socioeconomic aspects in the context of project's area of influence (i.e., primary project site and facilities, and associated facilities)	*Category A* - Require Prior Environmental Clearance (EC) from Central Government in the MOEF through recommendation of Environmental Appraisal Committee (EAC). *Category B* - Category B 1 projects require prior Environmental Clearance from State Environmental Impact Assessment Authority (SEIAA) through recommendations of State Environmental Appraisal Committee (SEAC) - *Category B2* does not require EIA, goes directly to Appraisal stage.	Power transmission (and distribution) projects are not listed as environmentally sensitive projects. In such cases, however, to comply with the SPS (2009), an environmental assessment needs to be carried out.
3.	Analysis of Alternatives		
	For projects with potential significant impacts (i.e., Category A) Examine alternatives to the project's location, design, and technology Document rationale for selecting the particular project location, design, and technology Consider "no project" alternative	Compares feasible alternatives to the proposed projects site, technology, design and operation including the “without project” situation in terms of their potential environmental impacts, the feasibility of mitigating these impacts, their capital and recurrent costs, their suitability under local conditions and abatement.	Under the National Law, Transmission projects have the “right of way” or RoW; same applies to Distribution projects In such cases, however, to comply with the SPS (2009), and analysis of alternatives needs to be carried out.
4.	Meaningful Consultation		
	Starts early and continues during implementation Undertaken in an atmosphere free of intimidation	Public consultation required to be undertaken through public notice prior to the approval by the MOEF only for Category B1 and A projects.	There are no major gaps. However the public consultation starts at a later stage in the project cycle.

S.No	ADB	GoI	Gaps
	Gender inclusive and responsive Tailored to the needs of vulnerable groups Allows for the incorporation of all relevant views of stakeholders	Starts at a later stage in the project cycle	
5.	Information Disclosure		
	ADB will post in its website the following: - Draft EIA report posted on ADB website at least 120 days prior to Board consideration - Draft EA/EARF prior to appraisal - Final or updated EIA/IEE upon receipt - Environmental monitoring report submitted by borrowers upon receipt	Information disclosure required to be undertaken through public notice prior to the approval by the MoEF only for Category A and B1 projects. This process is known as "public hearing".	No major gaps
6.	Grievance Redress Mechanism		
	Establish a mechanism to receive and facilitate resolution of grievances or complaints	Grievance redress mechanism is not mentioned in the regulations	Major gap. To comply with the SPS 2009, a mechanism for redressal will be set up.
7.	Use of Environmental Standards		
	Refers to WB Environmental Health and Safety Guidelines (EHS) 2007 (currently under revision)[17] If national regulations differ from the above,	Central Pollution Control Boards (CPCB) standards are followed as per law for all projects The Environment (Protection) Rules, 1986	The limiting value of some pollutants specified in the Indian regulatory standards maybe different than those specified in EHS 2007 guidelines and hence some gaps in certain situations.

[17] IFC General and power distribution EHS guidance; http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/ifc+sustainability/our+approach/risk+management/ehsguidelines

S.No	ADB	GoI	Gaps
	more stringent standards will be followed If less stringent levels are appropriate in view of specific project circumstances, provide full and detailed justification	Various legislations addressing aspects such as air and water pollution, hazardous substance management, etc. Occupational health and safety standards included in the Factories Act (India) and various India specific Labor Laws	
8.	Monitoring and Reporting		
	Prepare monitoring reports on the progress of EMP Retain qualified and experienced external experts or NGOs to verify monitoring information for Category A projects Prepare and implement corrective action plan if non-compliance is identified Requires submission of quarterly, semiannual, and annual reports to ADB for review	Post environmental clearance (EC) monitoring is stipulated by the regulations, with half yearly compliance reports to be made available as public documents. Latest report displayed on website of regulatory authority	No major gaps

2.4 Applicable International Environmental Agreements

25. International conventions such as the International Union for Conservation of Nature and Natural Resources (IUCN),[18] Convention on Migratory Species (CMS),[19] Convention on Wetlands of International Importance (Ramsar Convention),[20] Convention on Biological Diversity (CBD),[21] and Stockholm Convention on Persistent Organic Pollutants (POPs)[22] provide guidance in selecting and screening of subprojects under restricted and/or sensitive areas. India is a party to these conventions and is a member country to the the United Nations Framework Convention on Climate Change (UNFCCC) (see **Appendix 2** for details).

26. Assam has a freshwater lake (Dipor Beel), designated as a wetland under the Ramsar Convention (November 2002). The lake situated south-west of Guwahati city in Kamrup district, is not affected by or is close to any of the subprojects in Tranche 2.

27. Some animals and plant species found in Assam are included in the IUCN Level II category. No subprojects in Tranche 2 will affect these sensitive areas. The subprojects are not expected to alter bird migration or affect any species on the IUCN list.

2.5 Other Applicable Laws and Policies

28. According to the Child Labor Act of India,[23] adolescents between the ages of 14 to 18 years, if employed, shall not be engaged in hazardous working conditions. The Indian Factories Act 1948 and State Rules cover the Occupational Health and Safety of employees working only in factories and mines. However, the Indian Constitution stipulates provisions to ensure that the health and well-being of all employees are protected and the State has the duty to ensure

[18] IUCN provides a comprehensive analysis of the global conservation status, trends, and threats to species viz the IUCN Red List or Red Data List. The IUCN Red list establishes a baseline from which to monitor the change in status of species; provides a global context for the establishment of conservation priorities at the local level; and on a continuous basis, monitor the status of a representative selection of species (as biodiversity indicators) that cover all the major ecosystems of the world. http://www.iucnredlist.org/about/overview (Accessed October 2014)

[19] CMS, also known as the Bonn Convention aims to conserve terrestrial, aquatic, and avian migratory species whilst recognizing that States must be the protectors of species living within or pass through their corresponding national jurisdictions. Hence, the Parties to the Convention adhere to strictly protecting such species, conserving or restoring the places where they live. http://www.cms.int/newsroom/ (Accessed October 2014)

[20] Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. According to the Ramsar list of Wetlands of International Importance, there are 25-26 designated wetlands in India that are threatened; http://south-asia.wetlands.org/OurWetlands/OverviewofallwetlandswithRamsarstatus/tabid/634/Default.aspx (Accessed October 2014)

[21] According to CBD, States, in accordance with the Charter of the United Nations and the principles of international law, have the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. India is a party to the Cartagena Protocol on Biosafety to CBD which aims to ensure the safe handling, transport and use of living modified organisms resulting from modern biotechnology that may have adverse effects on biological diversity, taking also into account risks to human health; http://www.cbd.int/convention/ (Accessed October 2014)

[22] The Stockholm Convention on Persistent Organic Pollutants (POPs): Mindful of the precautionary approach as set forth in Principle 15 of the Rio Declaration on Environment and Development, the Objective of POPs is to protect human health and the environment from persistent organic pollutants; http://chm.pops.int/Home/tabid/2121/mctl/ViewDetails/EventModID/871/EventID/407/xmid/6921/Default.aspx (Accessed October 2014)

[23] The Ministry of Labor and Employment, Notification October 2006; http://labour.gov.in/content/division/acts-and-rules.php (Accessed October 2014)

protection (see **Appendix 2** for details). Aside from complying with the Child Labor Act of India, APDCL will also ensure compliance to applicable core labor standards of ADB-ILO during project implementation.[24]

[24]Asian Development Bank and International Labour Organization. Core Labour Standards, October 2006.

3. DESCRIPTION OF THE PROJECT

3.1 Project Description

29. Tranche 2 will focus on the improvement of distribution network system of Assam through the following outputs listed below.

Output 1: Expansion and Up-gradation of the Distribution System

(i) construction of one new 33 kV/11kV substation, install the associated terminal equipment, and associated 33 kV lines (4 km) and 11 kV (6 km);
(ii) construction of 137.5 km of 33 kV lines;
(iii) construction of 33 kV railway line and river crossing;
(iv) construction of eleven (11) new 33 kV bays at existing 33kV/11kV substations;
(v) construction of 7 km of 11 kV lines for the segregation of the rural and agricultural feeders;
(vi) re-conductoring/refurbishment of 956 km of 33 kV lines;
(vii) rehabilitation and renovation of six (6) new 33 kV bays at existing 33 kV/11kV substations;
(viii) re-conductoring/refurbishment of 1000 km of 11 kV lines;
(ix) re-conductoring/refurbishment 1555 km of LT lines;
(x) replacement of 204 existing oil-filled distribution transformers with dry-type transformers; and
(xi) replacement of existing 14 km of overhead 11 kV & LT line with underground cable.

Output 2: Strengthening institutional capacity of APDCL and APGCL

(i) setting up of one (1) independent meter testing laboratory;
(ii) establishing one (1) IT module for the introduction of centralized uniform revenue billing system for all consumers;
(iii) establishing two (2) area load dispatch centers; and
(iv) project implementation consultancy service.

30. **Table 3.1** presents the description of project components. **Appendix 3** provides the locational analysis of the proposed 33/11 kV substation.

Table 3.1 Description of the Project Outputs for Tranche 2 [25]

Item No.	Description	Unit	Total
Output 1: Expansion and Up-gradation of the Distribution System			
1	New 33/11 kV Substation and terminal equipment	Nos.	1
2	Associated 33 kV lines	km	4
3	Associated 11 kV lines	km	6
4	Associated terminal equipment	Nos.	1
5	New 33 kV lines	km	137.5
6	River crossing associated with new 33 kV lines	km	0.35
7	Railway crossings associated with new 33 kV lines	km	0.85
8	33 kV bay with terminal equipment, associated with new 33 kV lines	Nos.	11
9	New 11 kV line for segregation of rural feeder	km	7
10	Re-conductoring / refurbishment of 33 kV lines with ACSR Wolf Conductor	km	956
11	33 kV bay with terminal equipment, associated with 33 kV lines	Nos.	6
12	Re-conductoring / refurbishment of 11 kV lines with ACSR Raccoon Conductor	km	1000
13	Re-conductoring / refurbishment of LT lines with ACSR Rabbit Conductor	km	1555
14	Replacement of oil type DTR with Dry type DTR	Nos.	204
15	Replacement of overhead 11 kV and LT lines by XLPE underground cable	km	14
Output 2: Strengthening institutional capacity of APDCL and APGCL			
16	Setting up an independent meter testing laboratory	Nos.	1
17	IT module for introduction of centralized uniform revenue billing system for all consumers	Nos.	1
18	Area load despatch centres at Guwahati and Jorhat	Sets	2
19	Project implementation consultancy service (package)	1	24 months

[25]Note: ACSR =Aluminum Conductor Steel Reinforced; HV = high voltage; kV = kilovolt; kVA = kilovolt ampere; LT = low tension, low voltage; km = kilometer, XLPE = cross-linked Polyethelene; Wolf, Raccoon, and Rabbit are used in electricity industry to refer to specific types of overhead wire defining the number of strands and the cross sectional area.

3.2 Project Justification and Selection Criteria

31. Selected project components meet all the criteria in the Schedule 4 of the Framework Financing Agreement (FFA)[26] of the MFF and the provisions of the EARF approved in February 2014. The project components have been examined by the technical experts of APDCL for their technical, economic and financial feasibility. Project components are in alignment with the criteria in the Power System Master Plan for Assam.[27].

32. **Output 1**: Expansion of distribution system component aims to solve the overloaded substation and distribution lines. With this objective, APDCL adds one (1) 33/11 kV substation, about 137.5 km of 33 kV lines, 7 km of 11 kV lines and associated facilities. With this capacity enhancement, the existing APDCL consumers will get an improved service with better voltage profile. It will reduce technical losses and expand the service to new consumers.

33. Up-gradation of distribution system component under Output 1 will replace or renovate about 956 circuit-km of 33 kV conductors, 1000 circuit-km of 11 kV conductors, and 1555 km of low tension (LT) conductors. It will also replace 204 oil-filled transformers with dry-type transformers and replace 14 km of overhead 11 kV and LT lines with UG cabling. Replacement of aged and degraded parts in the system will reduce losses, improve the voltage profile and provide better and reliable service to APDCL customers. This component will also improve the public safety aspect by avoiding live conductors above ground in urban area. UG cabling will also improve aesthetic value of the urban environment in Guwahati City.

34. **Output 2**: Strengthening institutional capacity of APDCL and APGCL include: i) setting up of an independent meter testing laboratory; ii) Information technology (IT) module for introduction of centralized uniform revenue billing system (metering, billing, collection (MBC)); iii) Area load dispatch centers at Guwahati and Jorhat; and iv) project implementation consultancy service.

35. The independent meter testing laboratory will be established in the publicly-owned Assam Engineering College, Guwahati to test meters, in case of consumer disputes. Consumers will pay for the testing service and that revenue will be used for maintenance of the equipment. This arrangement is a win-win situation for the College and APDCL and the College has already officially agreed with the arrangement.

36. The information technology module for uniform billing system will complete the work of computerized billing system put in place under the funding of Accelerated Power Reforms and Development Program (APRDP) project. APRDP project introduced a computerized billing system for the high valued consumers. This project extends the same to 1,200,000 additional consumers. Efficient and transparent billing system is the expected benefit of this intervention. In addition, location of losses, energy auditing, and loss reduction efforts will be facilitated by the uniform computerized billing system. The proposed two (2) dispatch centers will introduce the much needed system control in the distribution system.

37. Output 2 also includes resources to hire a consulting firm for project management and implementation support. IT system for centralized billing and dispatch centers require technical

[26] http://www.adb.org/projects/47101-001/documents

[27] ADB 2012. Technical Assistance Report 8129 IND: Updating Load Forecasting and Power System Master Plan for Assam. Manila

expertise which is currently not available in the PMU and PIU. The implementation support mainly focuses on these aspects but will provide technical implementation support for the entire project.

3.3 Project Location

38. Outputs 1 and 2 will be implemented across the State, divided by regions namely Upper Assam Region (UAR), Central Assam Region (CAR), and Lower Assam Region (LAR). The power map of Assam presents the distribution network of APDCL (see Figure 3.1), while subprojects under Output 1 are presented in Figure 3.2, 3.3 and 3.4. These maps were provided in the Detailed Project Report of APDCL submitted 29 September 2014

i. **Figure 3.1** presents the general power (location) map for all subprojects in Assam.

ii. **Figure 3.2** presents New 33/11 kV S/S and new 33 kV lines under Guwahati Electrical Circle-I (GEC-I) and Guwahati Electrical Circle-II (GEC-II).

iii. **Figure 3.3** presents New 33 kV line under Barpeta and Rangia Electrical Circles.

iv. **Figure 3.4** presents new 33 kV line under Sibsagar (also written as Sivasafar) Electrical Circle.

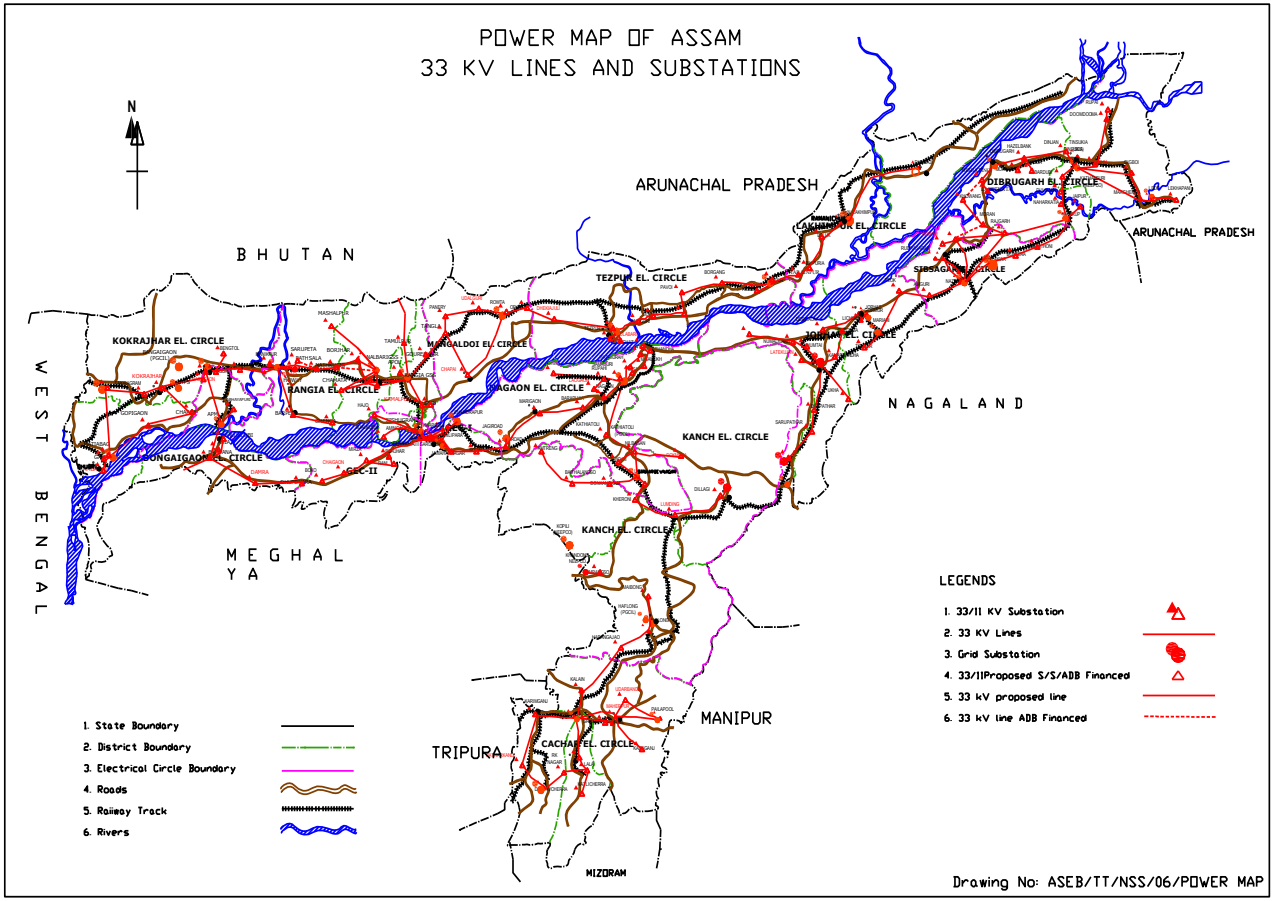


Figure 3.1 Power Map of Assam, APDCL[28]

[28] Note for Figure 3.1 through Figure 3.4: These maps are not image files and are copied from AutoCad. It can be viewed in AutoCad for more distinct features in high resolution by double clicking over the map in a PC where AutoCad software is installed.

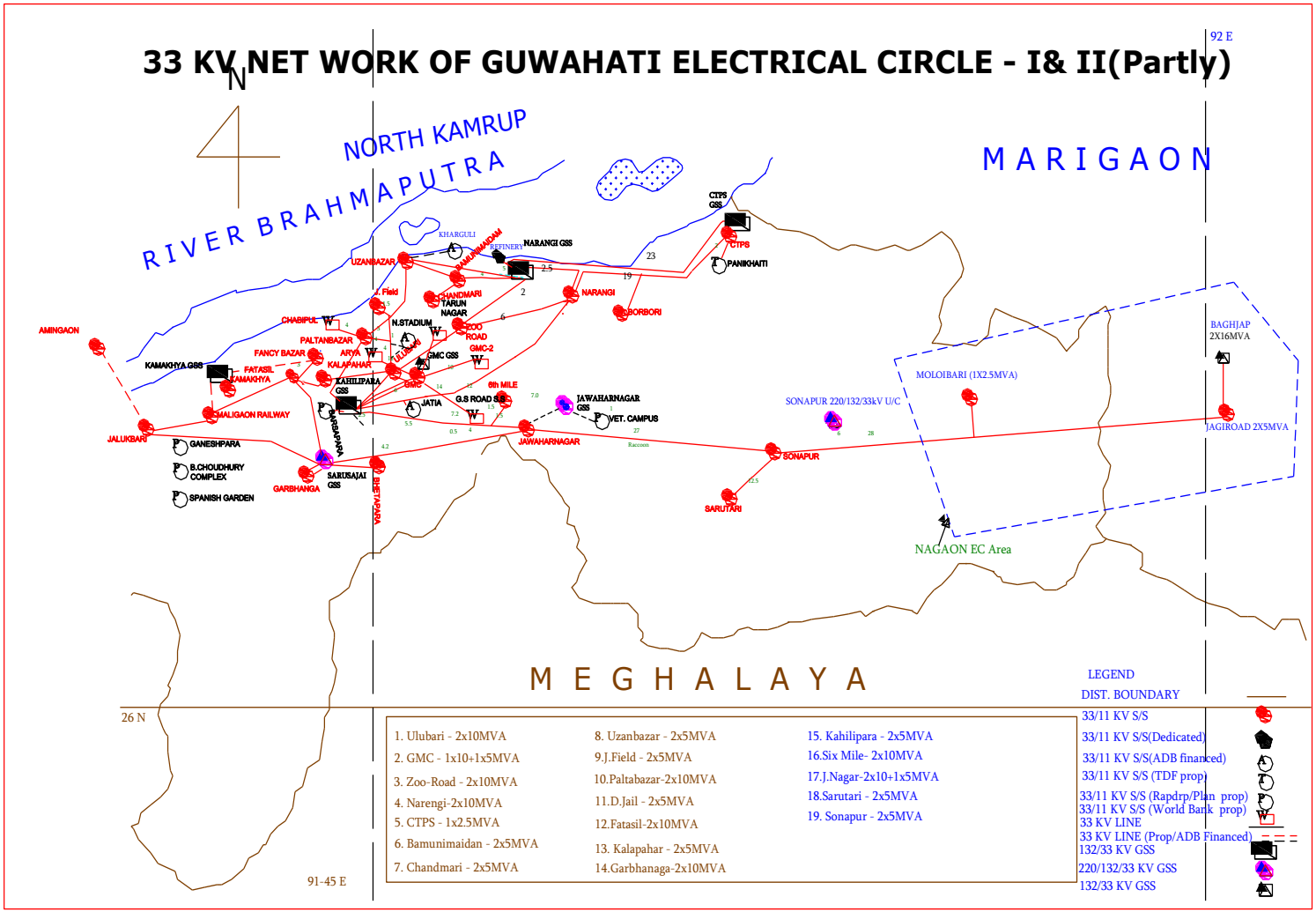
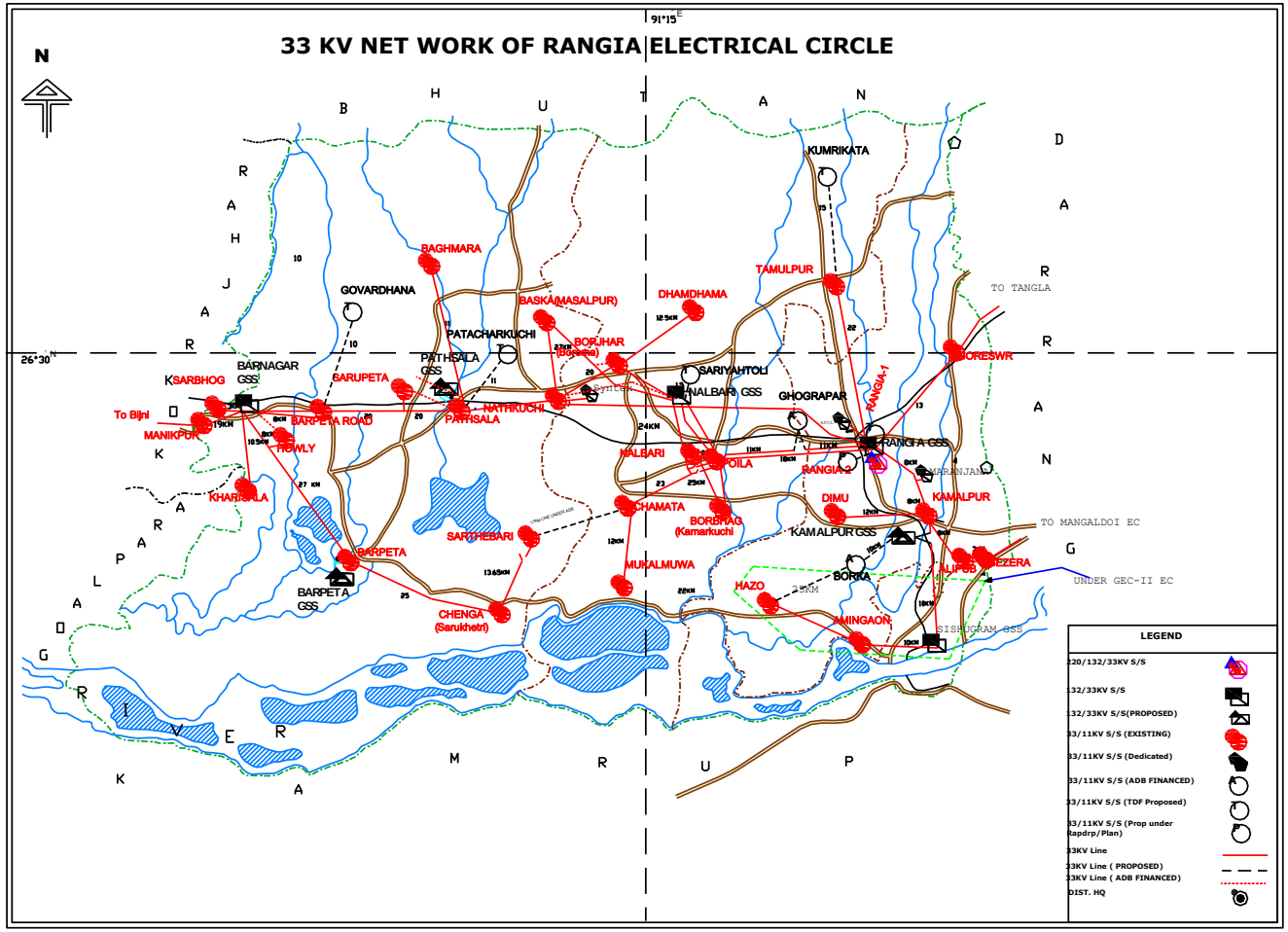
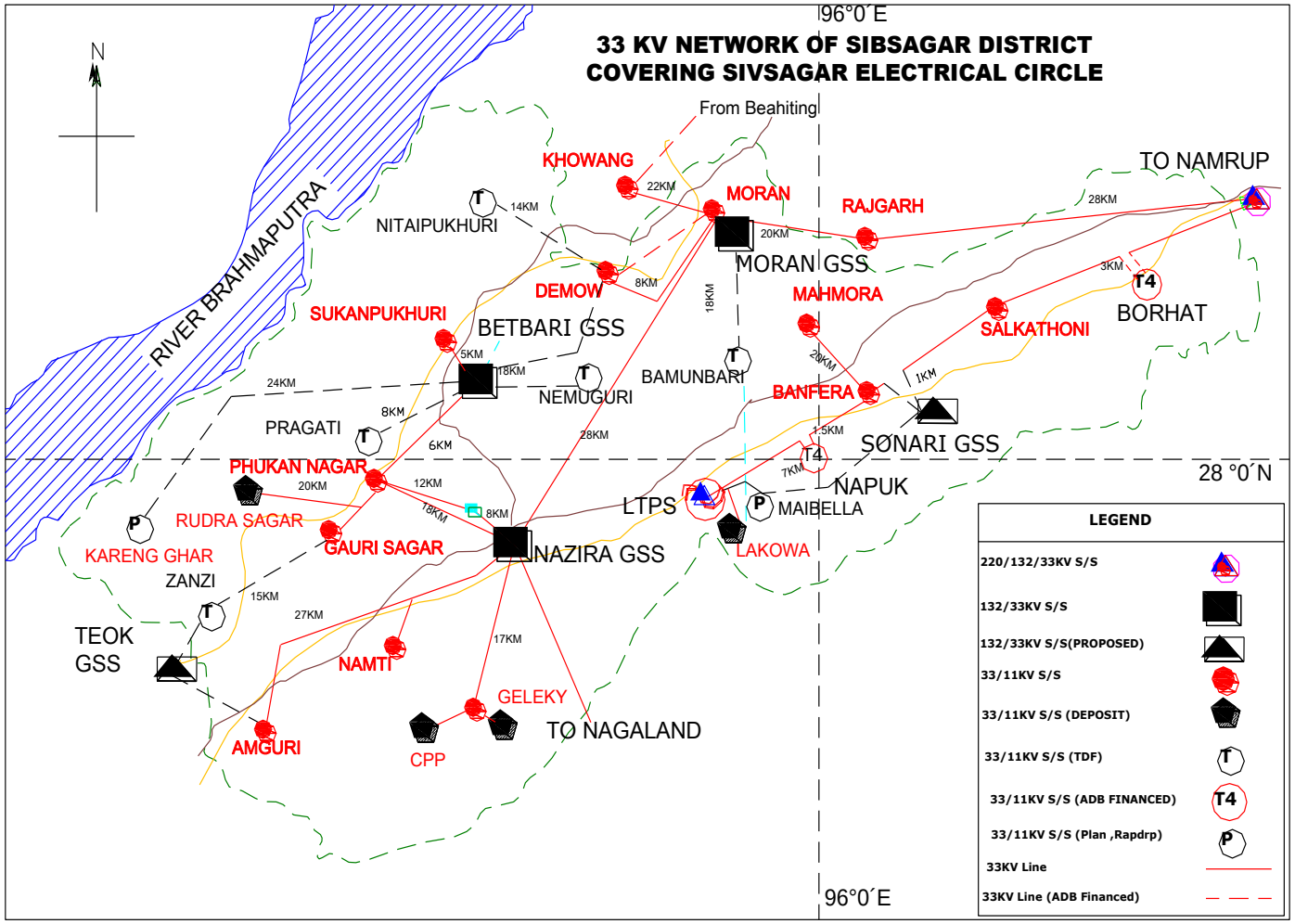


Figure 3.2 New 33/11 kV S/S and New 33 kV Lines under GEC-I and GEC-II



ASSAM POWER DISTRIBUTION COMPANY LTD. *AS ON AUGUST 2013* ***Project Implementation Unit***

Figure 3.3 New 33 kV Lines under Barpeta and Rangia Electrical Circle



ASSAM POWER DISTRIBUTION COMPANY LTD. *AS ON AUGUST 2013* *PROJECT PLANNING & DESIGN*

Figure 3.4 New 33 kV Lines under Sibsagar Electrical Circle

3.4 Project Implementation Schedule

39. The project is scheduled for completion within 30 months from the effective date of the project approval from ADB. Works such as transfer of land for new substation, survey and ROW works for distribution lines and other preliminary works will be taken up prior to the loan effective date to meet the time schedule. **Table 3.2** presents an indicative implementation schedule.

Table 3.2 Project Implementation Schedule

Activities / Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Design																														
Bidding Process																														
Award of Work																														
Site survey / ROW by contractor																														
Civil works, foundation, buildings																														
Setting equipment																														
Erection of sub-station, poles																														
Stringing of conductors,																														

other works																													
Commissioning and/ Test																													

3.5 Implementation Activities

40. Implementation of the project includes detailed and check survey, excavation (as needed), substation site leveling, backfilling (as needed), construction of substation, tower or pole assembly and erection, stringing of conductors and earth-wire, pre-commissioning and commissioning. For the erection of distribution poles and construction of substation, the following GoI standards/codes shown in **Table 3.3** will be complied by APDCL, as applicable.

Table 3.3 Relevant Construction Standards of the Government of India

GoI standards and/or codes	Title
IS:5613-1995 (Part-II)	Code of practice for design, installation and maintenance of overhead power lines. Section 1 - Designs. Section 2 - Installation and Maintenance
IS:269-1967	Ordinary rapid hardening and low heat Portland cement.
IS:456-2000	Code of practice for plain and reinforced concrete
IS:1786-1966	Cold twisted steel bars for concrete reinforcements
IS:4091-1967	Code of practice for design and construction of foundation for transmission line towers and poles
IS:3072-1975	Code of practice for the installation and maintenance of switchgear
IS: 3043-1987	Code of practice for earthing
IS: 1255-1983	Code of practice for the installation and maintenance of power cables • Cable sheaths and armour bonding to the earthing system
IS: 1866	Transformer insulation oil quality analysis • Circulation and filtering of oil, heating of oil, sampling and testing of oil • Inspection, storage, installation of transformers/reactors
IS: 7205-1974	Safety code for erection of structural steelworks

3.6 Project Management and Implementation Structure

41. The GoA chairs the Steering Committee for the MFF. The key institutions involved in project management and implementation are the Project Management Unit (PMU) and the Project Implementation Unit (PIU). **Figure 3.5** presents the project management structure for Tranche 2.

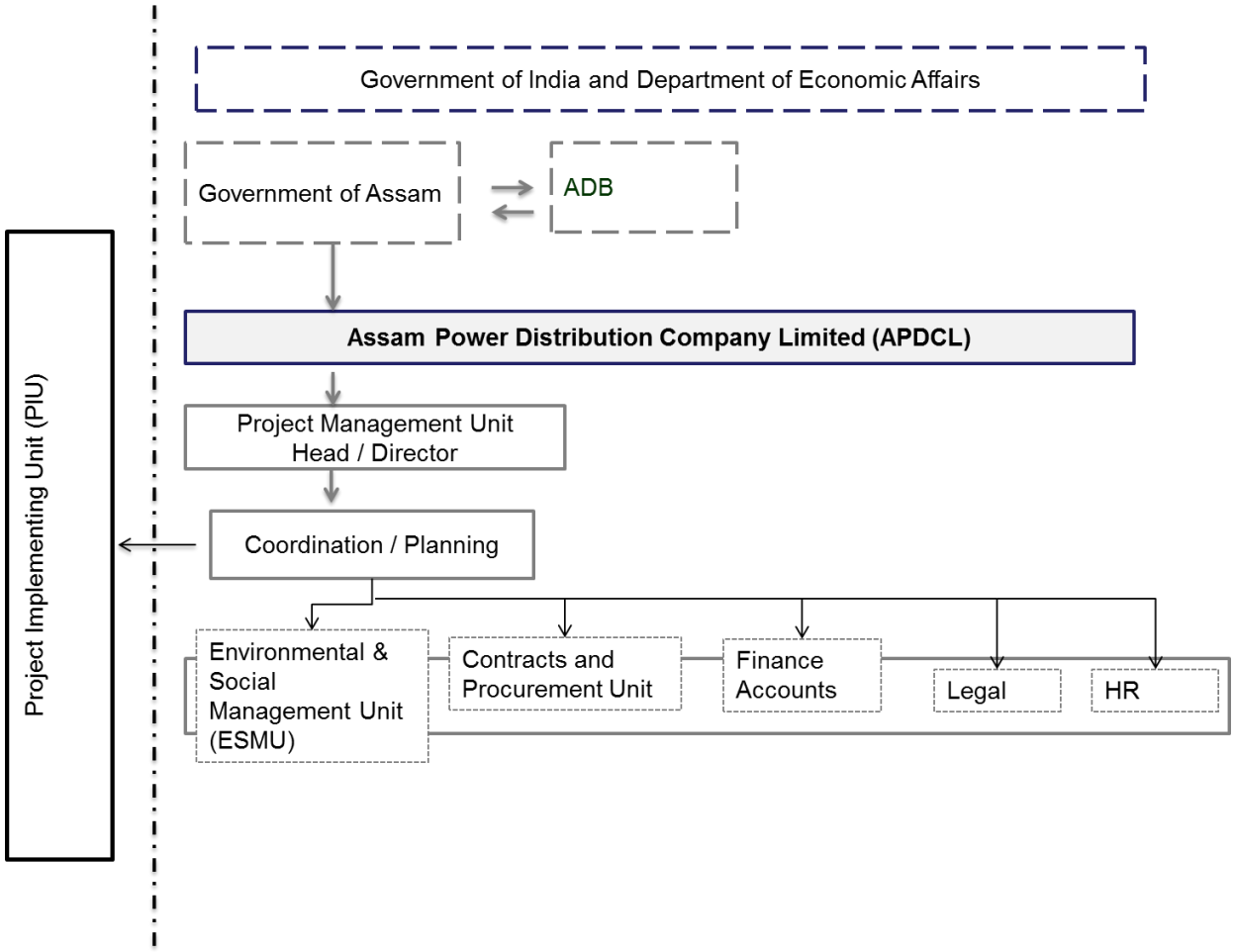


Figure 3.5 Project Management Structure for Tranche 2

4. DESCRIPTION OF THE ENVIRONMENT

42. The project and subprojects in Tranche 2 are located in various geographic zones across Assam, namely: Lower Assam Region (LAR), Central Assam Region (CAR), and Upper Assam Region (UAR) which comprises of 27 districts. APDCL's functional activities take place through its designated Electrical Circles (EC). An EC implies distribution coverage for a given district. There are a total of 20 ECs. Most ECs cover one district while the following EC such as Cacchar, Boningaon, Barpeta, KANCH, and Lakshimpur cover at least two districts. The matrix given below presents an overview of Output 1 subproject activities in respective regions and districts (19 districts out of total 27 districts) corresponding to an EC. This will guide the Description of the Environment. Output 2 does not involve any construction related activities or corresponding environmental impacts.

S. No	District	Name of Electrical Circle	New 33/11 kV S/S	New 33 kV Line	New 11 kV line	R / M – 33 kV line	R/M - 11 kV line	R/M – LT
UPPER ASSAM REGION (UAR)								
1	Sivasagar and partly covering Dibrugarh	Sivasagar Circle		✓		✓	✓	✓
2	Dibrugarh	Dibrugarh Circle				✓	✓	✓
3	Jorhat	Jorhat Circle				✓	✓	✓
4	Tinsukia	Tinsukia Circle				✓	✓	✓
5	Golaghat	Golaghat Circle				✓	✓	✓
CENTRAL ASSAM REGION (CAR)								
6	Sonitpur	Tezpur Circle				✓	✓	✓
7	Nagaon	Nagaon Circle				✓	✓	✓
8	Lakhimpur & Dhemaji	North Lakhimpur Circle				✓	✓	-
9	Cachar	Cachar Circle				✓	✓	✓
10	Hailakandi & Karimganj	Badarpur Circle				✓	✓	✓
11	Marigaon	Morigaon Circle					✓	✓
LOWER ASSAM REGION (LAR)								
12	Barpeta	Barpeta Circle / Rangia Circle		✓		✓		✓
13	Nalbari			✓				

14	Kamrup Metro	Guwahati – I Circle	✓	✓	✓	✓	✓	✓
15	Kamrup Metro	Guwahati –II Circle		✓	✓	✓	✓	✓
16	Darang	Mangaldoi I Circle				✓	✓	✓
17	Bongaigaon	Bongaigoan Circle				✓	✓	✓
18	Kokrajhar	Kokrajhar I Circle				✓		
19	Kamrup Rural	Rangia Circle				✓	✓	✓

*Blank cell implies no project activity with respect to proposed lines or R&M of existing lines.

4.1 Geographical Location of Assam

43. Assam is a northeastern state of India with its capital at Dispur. The State is situated between 90-96 degrees east Longitude and 24-28 degrees north Latitude and is bordered by the Kingdom of Bhutan and Arunachal Pradesh on the north and east, respectively. Along the south border lie the States of Nagaland, Manipur and Mizoram. Along the south-west is the State of Meghalaya while along the west is the State of West Bengal and Bangladesh.[29] Assam covers an area approximately 78,550 square kilometer (km^2). According to the 2011 Census, the population of the Assam was 31 million.

Source: Google maps, accessed October 2014

[29] Assam at a glance, Official Website of Assam, GoA http://www.assaminfo.com/

Figure 4.1 Map of Assam

4.2 Physical Resources

4.2.1 Topography, Geology, and Soils

44. Majority of the areas in Assam are floodplains of the River Brahmaputra. The altitude of the terrain varies from 50 meters to 600 meters. The eastern plains have an altitude of about 600 meters while the Cachar plains situated in its southern part have an altitude of about 50 meters. The central and south-central part, comprising of North Cachar Hills and Rengma Hills, have an altitude range of 300 meters to 150 meters. The western part, comprising of North and South Brahmaputra Hills, have similar altitude range. The soils of Assam are very rich in nitrogen and organic matter. The northern areas, nearer to the River Brahmaputra, have new alluvium while the southern areas or areas near the foothills have old alluvium. The areas with older alluvium, the best for tea cultivation, are dotted with a large number of tea gardens. The high fertility of soil makes it suitable for cultivating varieties of crops throughout the year such as cereals, pulses, oilseeds, plantation crops, etc.[30]

4.2.2 Meteorology and Climate

45. The seasons in Assam are mainly divided into two: cool season from November to February and rainy season from June to September. Assam also has two short periods of spring from March to May and autumn from September to October. During the short spring season, Assam may receive some amount of rain, keeping the temperature low. In the plains, the maximum temperature during the rainy season is around 38^{o}C while in the cool season, the minimum temperature is 8^{o}C. The rainy season is marked with high humidity. The annual rainfall is more than 2,000 mm.

4.2.3 Air Quality and Noise

46. The Pollution Control Board, Assam (PCBA)[31] conducts periodic evaluation of air pollution in the State under the National Air Quality Monitoring Program (NAMP) of the Central Pollution Control Board (CPCB)[32]. Under the NAMP, four pollutants – SO_x, NO_x, Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter (RSPM) have been identified for regular monitoring at 7 monitoring stations across Assam (frequency 16-hr, 2 days/week) including 4 monitoring stations in Guwahati located at Bamunimaidam, Gopinath, Dispur, and Santipur (frequency 16-hr, 6 days/week).[33] The analysis of the ambient air quality data from 2004 until 2010 shows that the RSPM and SPM in almost all the monitoring stations in Guwahati are above the prescribed standards set by the CPCB while the SO_x and NO_x were within the prescribed standards. These results are corroborated by a research paper published in the International Journal of Multidisciplinary Research (2014).[34] The poor air quality is mainly due to vehicular emissions and exhaust from the brick kiln industries. **Table 4.1** presents the National Ambient Air Quality Standards (NAAQS) prescribed by the CPCB.

[30] http://asmenvis.nic.in/Database/Soil_1048.aspx
[31] Pollution Control Board, Assam http://www.pcbassam.org/consent.htm#C1
[32] Central Pollution Control Board, India, http://www.cpcb.nic.in/air.php
[33] Status on number of monitoring stations is as per PCBA's Annual Report, 2008
[34] http://zenithresearch.org.in/images/stories/pdf/2014/OCT/ZIJMR/9_ZIJMR_VOL4_ISSUE10_OCTOBER2014.pdf

Table 4.1 National Ambient Air Quality Standards, CPCB

S. no.	Pollutants	Time weighted average	Concentration in ambient air (µg/m³)
1	SO_2	Annual 24-h	50 80
2	NO_2	Annual 24-h	40 80
3	PM_{10}	Annual 24-h	60 100
4	$PM_{2.5}$	Annual 24-h	40 60
5	Ozone	8-h 1-h	100 180
6	Lead	Annual 24-h	0.5 1
7	CO	8-h 24 hours	02 04
8	NH_3	Annual 24-h	100 400

Source: http://cpcb.nic.in

47. Noise standards being implemented by the PCBA are the same as the standards prescribed by the National Noise Pollution (Regulation and Control) Rules, 2000 as presented in **Table 4.2.**[35] The PCBA does not conduct regular noise monitoring except during the occasion of Durga Puja in month of October when firecrackers are used throughout the State as a mark of celebration.

Table 4.2 Noise Standards, CPCB

Noise Standards			
Code		Day Time (6 am – 9 pm)	Night Time (9 pm – 9 am)
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zone	50	40

Source: MOEF and CPCB

4.2.4 Natural Hazards

48. Assam is prone to natural hazards such as earthquakes, floods, landslides, cyclones and occasional droughts. The population is vulnerable to perennial floods, landslides and environmental degradations.[36] The GoA, through its State Disaster Management Authority,

[35] MoEF, http://moef.gov.in/citizen/specinfo/noise.html
[36] Assam State Disaster Management Plan, http://sdmassam.nic.in/pdf/asdmp.pdf

has made a comprehensive State Disaster Management Plan as well as District Wise Disaster Management Plan to counter such eventualities.[37] The plan follows the mandate stipulated under the Disaster Management Act 2005 and Assam Disaster Management Rules 2010. The Plan identifies the vulnerability of different parts of the State to different forms of disasters; and suggests the measures to be adopted for prevention and mitigation of disasters in a manner in which the mitigation measures are integrated with the development plan and projects.

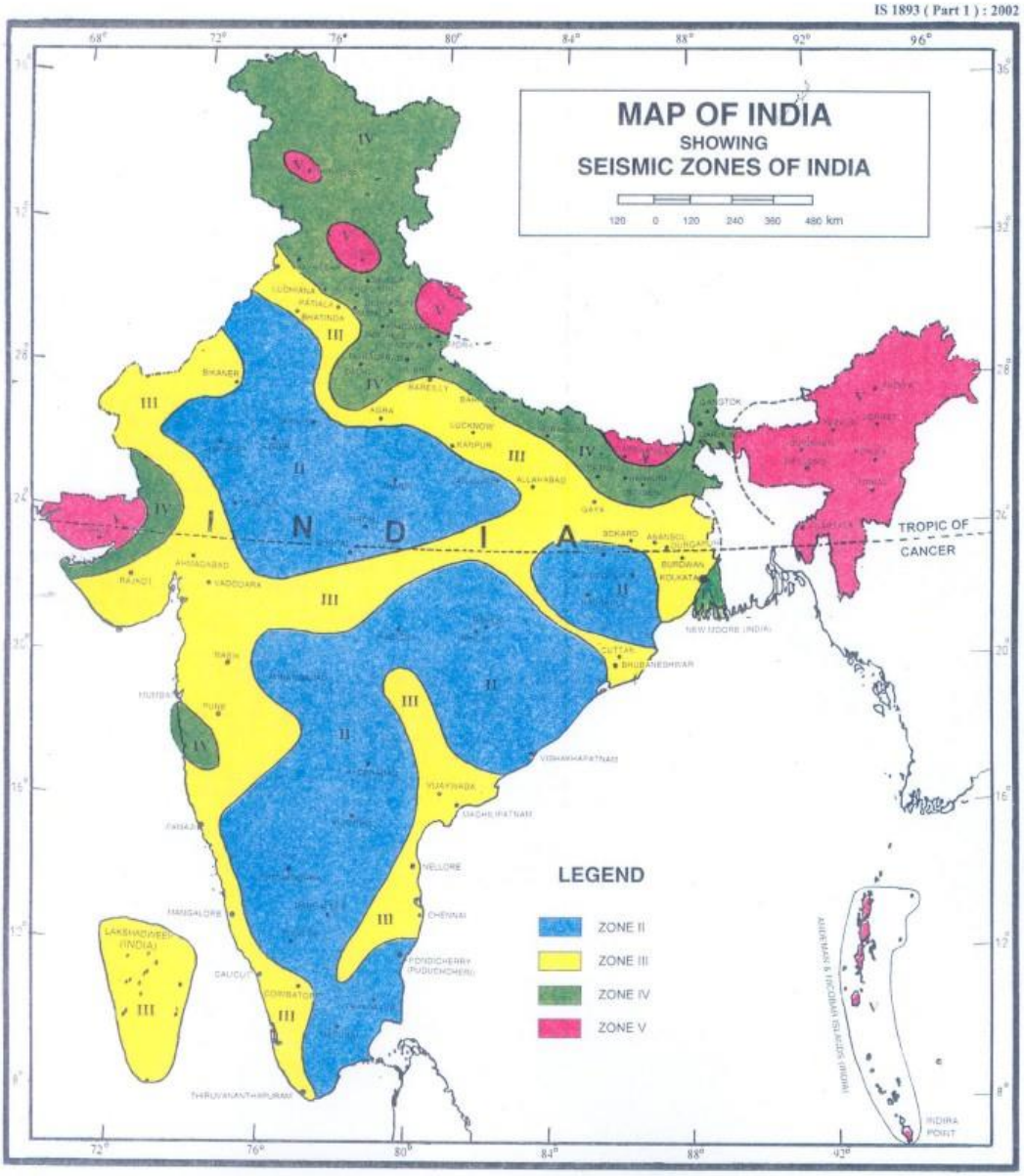
4.2.4.1 Seismicity

49. The Bureau of Indian Statistics (IS-1893 Part 1, 2002) classified India into four seismic zones based on various scientific inputs including earthquake data from India Meteorological Department (IMD). The seismic zones in India are presented in **Table 4.3** and shown in **Figure 4.2**.

Table 4.3 Seismic Zones in India

Seismic Zone	Intensity on Modified Mercalli Scale	% of total area
II (Low intensity zone)	VI (or less)	43%
III (Moderate intensity zone)	VII	27%
IV (Severe intensity zone)	VIII	18%
V (Very severe intensity zone)	IX (and above)	12%

[37] Assam State Disaster Management Authority Ihttp://sdmassam.nic.in/dmp.html



NOTE : Towns falling at the boundary of zones demarcation line between two zones shall be considered in High Zone.

Figure 4.2 Seismic Zones of India

50. The great Assam earthquake of 1897 is the largest known Indian intraplate earthquake. The earthquake raised the northern edge of the Shillong Plateau by more than 10 meters. It resulted in the destruction of structures over much of the Plateau and surrounding areas and also caused widespread liquefaction and flooding of the Brahmaputra and Sylhet floodplains. The recent earthquake hazard history of Assam (2004- 2011) is presented in **Table 4.4.**

51. Assam has been placed under seismic Zone V that has highest potential for occurrence of severe earthquake. Therefore, the subprojects of Tranche 2 are located in areas within seismic Zone V and are prone to seismic intensity of IX and above based on the Modified Mercalli Scale. The Bureau of Indian Standards (BIS) estimates the earthquake hazard based on previously known earthquakes but the database in India is still incomplete especially on earthquakes prior to the historical period (before 1800 A.D.). Therefore, these seismic zones offer a rough guide on earthquake hazard in any particular region and need to

be regularly updated. All civil works and structures will follow the national guidance on seismic deisgn that calls for identification of a maximum credible earthquake scenario and associated ground acceleration parameters.

Table 4.4 Earthquakes in Assam, 2004-2011

Date	Epicenter	Lat	Long	Origin Time	Magnitude
9 Dec 2004	Silchar Region, Assam	24.710 N	92.523 E	08:49:00 UTC	Mw 5.4
18 August 2003	Upper Tsangpo, Xizang, Eastern Tibet	29.547 N,	95.562 E	09:03:02 UTC	Mw 5.5
1 June 2005 -	Upper Dibang Valley, Arunachal Pradesh	28.871 N	94.598 E	04:16:48 UTC	Mw 5.7
14 Feb 2006	Mana, North Sikkim,	27.377 N	88.362 E	00:55:23 UTC	Mw 5.3
23 Feb 2006	Bhutan	26.863 N	91.632E	20:07:26 UTC	Mw 5.2
18 May 2007	Nambu, North Sikkim,	27.302 N	88.159 E	12:40:02 UTC	Mb 4.6
20 May 2007	Singyang, North Sikkim	27.303 N	88.191 E	14:18:18 UTC	Mb 5.0
2 Dec 2008	India Nepal Border Region	27.373 N	88.051 E	05:11:42 UTC	Mw 5.2
19 Aug 2009	Assam Region	26.556 N	92.470 E	10:45:13 UTC	Mw 5.0
21 Aug 2009	Bhutan	27.332 N	91.437 E	08:53:05 UTC	Mw 6.1
29 Oct 2009	Bhutan	27.262 N	91.417 E	17:00:38 UTC	Mw 5.1
31 Dec 2009	Bhutan	27.319 N	91.510 E	09:57:29 UTC	Mw 5.5
4 Feb 2011	Myanmar region	24.618 N	94.680 E	13:53:46 UTC	Mw 6.2
18 Sept 2011	India Nepal Border Region	27.723 N	88.064 E	12:40:48 UTC	M6.9
30 December 2011	Central Assam region			15:14:01 UTC	M3.6
18 December 2011	Sikkim-Nepal border			21:35:26 UTC	M4.6
Source: www.asc-india.org (Last assessed on 20Mar2012), USGS & Results of NEIC Catalogue Search					

Source: State Disaster Management Plan for Assam, www.asc-india.org

4.2.4.2 Flooding and Droughts

52. **Floods:** The Brahmaputra River and the Barak River are the two major river systems in Assam. Assam is prone to floods mainly because it receives heavy rainfall within a short time and numerous natural and anthropogenic factors inhibit the main channel's coping mechanism. Additionally, these rivers are in their early stage of maturity and are very active agents of erosion. The Brahmaputra valley occupies most of the North Assam covering Goalpara, Kokrajhar, Dhubri, Kamrup, Nalbari, Barpeta, Nagaon, Darrang, Sonitpur, Sibsagar, Jorhat, Golaghat, Lakhimpur and Dibrugarh, and Tinsukia districts. Some of the districts covered in Tranche 2 (Nalbari, Barpeta, Nagaon, Sibsagar, Jorhat, Golaghat, Dibrugargh and Tinsukia) are part of the valley. Site specific flood risk can be readily identified based on historical meteorological records, and appropriate flood control measures will be incorporated into civil works and structural design following best engineering practice. The valley had experienced major floods in 1954, 1962, 1966, 1972, 1974, 1978, 1983, 1986, 1988, 1996, 1998, 2000 and 2004. As recent as September 2014, Assam (and

Meghalaya) has experienced flash floods leaving at least 10 people dead and over 0.1 million persons affected. **Table 4.5** presents the history of flood hazard in Assam, while **Figure 4.3** presents the flood hazard map of India.

Table 4.5 History of Flood Hazard in Assam (1998 – 2007)

Affected Area (%)	No. of Districts	Name of Districts
0-10%	4	Baska, Chirang, North Cachar, Karbi Anglong
10-20%	2	Kokrajhar, Tinsukia
20-30%	6	Cachar, Golaghat, Hailakandi, Kamrup (Metro), Karimganj, Udalguri
30-40%	6	Bongaigaon, Dhubri, Dibrugarh, Golpara, Kamrup(Rural), Sonitpur
40-50%	5	Dhemaji, Jorhat, Nalbari, Nagaon, Sibsagar
50-60%	1	Lakhimpur
60-70%	1	Barpeta
70-80%	2	Darrang and Morigaon

Source: State Disaster Management Plan for Assam, www.asc-india.org

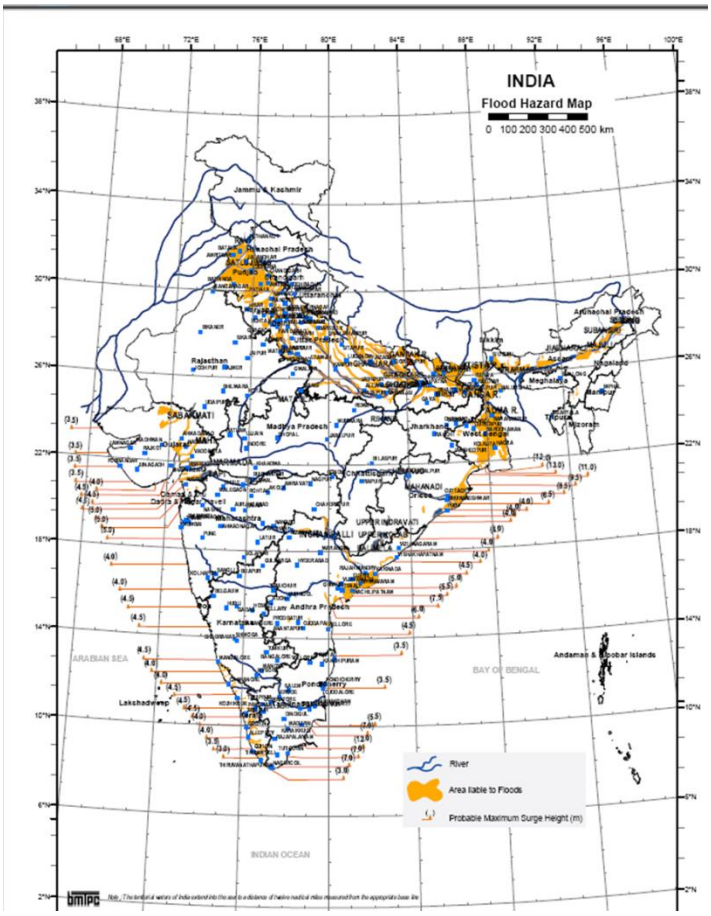


Figure 4.3 Flood Hazard Map, India[38]

[38] The legend is the above diagram is as follows in descending order: a). river; b). area liable to flood; and c).probable maximum surge height (m)

53. **Droughts:** Several districts of Assam were affected due to drought-like situations in 2005 and 2006.[39] During the intense drought-like conditions that prevailed in 15 districts of Assam in the summer monsoon months of 2006 owing mainly to below normal (nearly 40%) rainfall in the region, more than 75% of the 26 million people associated with livelihoods related to agriculture were affected. Due to this condition, Assam suffered a loss of more than INR 1 billion from crop failure and other peripheral effects. The recent spell of drought in October 2008 until July 2009 also severely affected agriculture and production of hydropower in Assam.

4.2.4.3 Landslides

54. Assam is located in the Himalayas which are considered to be geologically unstable and seismically very active. Assam has a history of earthquakes and these are usually accompanied by damaging landslides in the region (GSI, 2011). Even though much of the minor landslides go unnoticed some of the major events which have occurred in the region over the past six years are presented in the **Table 4.6.** The most recent major landslide triggered by torrential rains in Kharghuli, district Kamrup occurred in 2011; this district is included in Tranche 2.

Table 4.6 Major Landslides in Assam

Date	Type	District	Name of the Place	Cause of Landslide
5- 8 Oct 2004	Land-slide	Kamrup	Guwahati Urban	Heavy concentrated rainfall
28 Aug, 2009	Rock-slips and land slide	North Cachar Hills	Mahur and Phaiding	Torrential rains
12-Sep-10	Rock-slips and land-slide	Lakhimpur, Dhemaji, Golaghat, and Bongaigaon	-	-
16-Jun-10	-	North Cachar Hills	Jatinga, Longrangjao, Mahur and Wadringdisa	Heavy rains
3-Jun-10	Mud-slide	Karimganj	Rongpur Village	-
2-Apr-10	-	Cachar	Dholai Block	Torrential downpour

Source: Report, State Disaster Management Plan for Assam, www.asc-india.org

[39] Assam State Disaster Management Plan, http://sdmassam.nic.in/pdf/asdmp.pdf

4.2.4.4 Wind and Cyclones

55. Along the west side of Assam is Bangladesh, which is prone to cyclone/winds. Every year, about 60 % of the area in Assam is affected by a cyclone episode in Bangladesh. Due to the location, districts within the project area that will be more prone to cyclone and winds are Cachar, Kokrajhar, Bongaigaon, Kamrup, Barpeta, Nalbari, Nagaon, Marigaon, Lakhimpur, Sibsagar, Jorhat, Golaghat, Dibrugarh, and Tinsukia, with wind speed likely up to 50 m/s. Some of the districts covered in Tranche 2 (Bongaigaon, Kamrup, Barpeta, Nalbari, Nagaon, Sibsagar, Jorhat, Golaghat, Dibrugarh, Tinsukia) are prone to wind and cyclones. **Figure 4.4** presents the wind and cyclone hazard map of India.

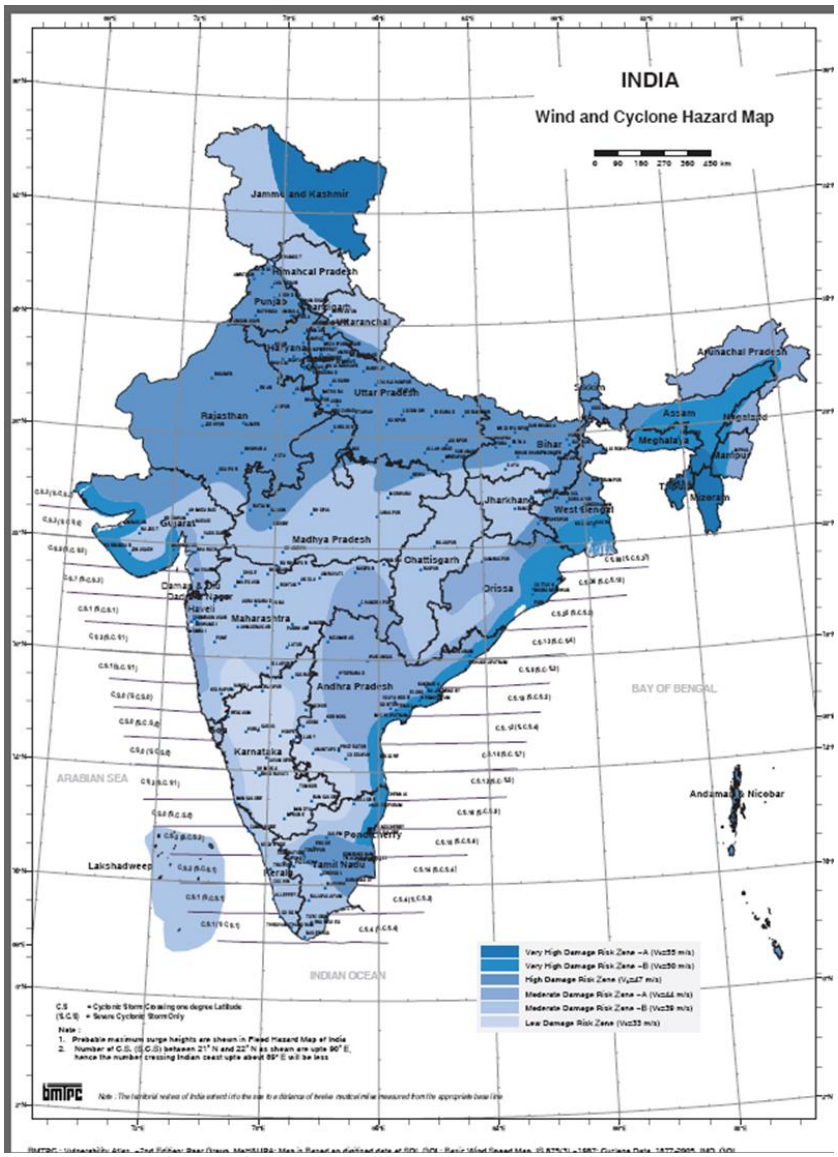


Figure 4.4 Wind and Cyclone Hazard Map, India[40]

4.2.5 Water Resources

56. **Surface water:** There are two major river systems in Assam, the River Brahmaputra and River Barak. The River Brahmaputra flows through a valley from east to west over a river length of approximately 650 km. The alluvial deposits on the banks of River Brahmaputra are beneficial for cultivation of crops. This has also attracted semi-permanent settlements. The River Barak flows westward from Lakhipur through the Cachar Plains region of Assam over a river length of approximately 130 kilometers. Assam harbors at least 3,500 freshwater wetlands; most of these wetlands are in the floodplains of the rivers Brahmaputra and Barak and their tributaries and include beels, swamps and marshes.

57. Under the National Water Quality Monitoring Program (NWQMP) and with the help of the CPCB, the PCBA has been regularly monitoring quality of surface water in various water sources across the State. As of 2008, there were 101 water quality monitoring stations in Assam measuring parameters such as DO, BOD, Total Coliform and Fecal Coliform on a monthly basis. Surface water quality monitoring results (January-December 2008) suggest that bacteriologically, the water quality of Brahmaputra and Barak is very poor, making it unfit for drinking without treatment.

58. **Ground water**: Assam is considered to have high potential for ground water resources. The Brahmaputra valley covering more than 70% of the total geographical area of Assam contains a prolific aquifer system with water table at 5 meters below ground surface. Also, the Barak valley has a good potential for development of ground water resources. The recoverable recharge of ground water has been estimated at 2 million hectare meter per year.[41] The lifting of ground water through dug wells, tube wells, shallow tube wells and deep tube wells for irrigation, domestic and industrial use is common in Assam.

59. Under the NWQMP and with the help of CPCB, the PCBA has been collecting and monitoring groundwater (well-water) from 32 places across the State on a semi-annual basis. Parameters analyzed are Cadmium, Copper, Lead, Chromium, Nickel, Zinc, Mercury, Iron and Arsenic. Groundwater quality monitoring results (January- December 2008) suggest that values for Arsenic and Fluoride exceed beyond the permissible limit (see Table 4.7).[42]

60. Table 4.7 presents the Bureau of Indian Drinking Water Quality Standards as provided by the Central Ground Water Board (GGWB), Ministry of Water Resources of India.

[40] The legend in the above diagram is as follows in descending order: a). very high damage risk zone A (v=55m/s); b).very high damage risk zone B(v=50m/s); c).high damage risk zone (v=47m/s); d).moderate damage risk zone A (v=44m/s); e).moderate damage risk zone B (v=39m/s); f). low damage risk zone(v=33m/s)
[41] Central Ground Water Board (1984), Ground Water Estimation Committee, Ministry of Irrigation.
[42] http://cgwb.gov.in/CR/achi_hydroche_stu.html

Table 4.7 BIS Drinking Water Quality Standards

SR.NO.	PARAMETERS	DESIRABLE LIMIT	PERMISSIBLE LIMITS IN THE ABSENCE OF ALTERNATE SOURCE
1	pH	6.5 to 8.5	No relaxation
2	Colour (Hazen Unit)	5.0	25
3	Turbidity (JTU)	5.0	10
4	Odour	Unobjectionable	-
5	Total dissolved solids mg/L	500	2000
6	Total hardness as $CaCO_3$ mg/L	300	600
7	Calcium as Ca mg/L	75	200
8	Magnesium as Mg mg/L	30	100
9	Chloride as Cl mg/L	250	1000
10	Sulphate as SO_4 mg/L	200	400
11	Nitrate as NO_3 mg/L	45	No relaxation
12	Iron as Fe mg/L	0.3	1.0
13	Fluoride as F mg/L	1.0	1.5
14	Arsenic as As mg/L	0.01	0.05
15	Manganese as Mn mg/L	0.1	0.3
16	Zinc as Zn mg/L	5	15
17	Copper as Cu mg/L	0.05	1.5
18	Chromium as Cr^{+6} mg/L	0.05	No relaxation
19	Lead as Pb, mg/L	0.05	No relaxation
20	Mercury as Hg, mg/L	0.001	No relaxation
21	Cadmium as Cd, mg/L	0.01	No relaxation
22	Cyanide as Cn, mg/L	0.05	No relaxation
23	Minerals Oil mg/L	0.01	0.03
24	Phenolic compounds mg/L	0.01	0.002
25	Coliform Organism, MPN 100 ml	10.0	-
26	Residual free chlorine, mg/L	0.2	-
27	Pesticides mg/L	Absent	0.001
28	Selenium as Se mg/L	0.01	No relaxation
29	Aluminium as Al mg/L	0.03	0.2
30	Boron mg/L	1	5
31	Alkalinity mg/L	200	600
32	Anionic detergents (as MBAS) mg/L	0.2	1.0
33	Radioactive Materials a) Alpha emitters Bq/L b) Beta emitters Bq/L	- -	0.1 1

4.3 Biological Resources

4.3.1 Terrestrial Ecology

4.3.1.1 Forest Cover

61. The Recorded Forests Area (RFA) of Assam is approximately 26,748 km^2 (or 35% of the total geographical area) based on the interpretation of satellite data from November 2008 to January 2009. It includes 312 Reserved Forests (13,870 km^2 or 52% of the RFA), 145 Proposed Reserved Forests (3,103 km^2 or 12% of the RFA), Protected Areas (3,925 km^2 or 15% of the RFA) and Un-classed State Forests (5,865 km^2 or 33% of the RFA).[43]

62. In terms of forest canopy density classes, Assam has 1,444 km^2 supporting very dense forest; 11,404 km^2 of moderately dense forest; and 14,825 km^2 of open forest. District-wise forest-cover in different canopy density classes along with the changes compared to 2009 assessment are given in **Table 4.8**.

Table 4.8 District Wise Forest Cover, km^2

District Area	Geographical area (GA)	Very dense forest	Moderate dense forest	Open forest	Total	% Total of GA	Change	Scrub
Barpeta	3,245	35	179	183	397	12.23	-4	2
Bongaigaon	2,510	33	267	221	521	20.76	3	3
Cachar	3,786	81	975	1,180	2,236	59.06	5	18

[43] http://assamforest.in/forestGlance/assamForest_glance.php

District Area	Geographical area (GA)	Very dense forest	Moderate dense forest	Open forest	Total	% Total of GA	Change	Scrub
Darrang	3,481	12	91	367	470	13.50	-16	2
Dhemaji	3,237	7	124	160	291	8.99	1	10
Dhubari	2,798	21	201	196	418	14.94	1	10
Dibrugarh	3,381	29	165	564	758	22.42	0	0
Goalpara	1,824	1	71	265	337	18.48	1	8
Golaghat	3,502	6	122	397	525	14.99	4	0
Hailakandi	1,327	13	373	400	786	59.23	0	5
Jorhat	2,851	2	113	498	613	21.50	3	0
Kamrup	4,345	68	612	753	1,433	32.98	1	26
Karbi Anglong"	10,434	566	3,819	3,554	7,939	76.09	-19	24
Karimganj	1,809	3	318	539	860	47.54	4	48
Kokrajhar	3,169	208	716	220	1,144	36.10	-19	2
Lakhimpur	2,277	4	118	171	293	12.87	5	6
Morigaon	1,704	6	41	86	133	7.81	1	4
North Cachar Hills	4,888	135	1,553	2,562	4,250	86.95	-6	1
Naogaon"	3,831	40	353	403	796	20.78	7	8
Nalbari	2,257	4	70	208	282	12.49	0	0
Shivsagar	2,668	8	144	543	695	26.05	2	1
Sonitpur	5,324	56	280	624	960	18.03	7	0
Tinsukia	3,790	106	699	731	1,536	40.53	0	4
Grand Total	**78,438**	**1,444**	**11,404**	**14,825**	**27,673**	**35.28**	**-19**	**182**

Source: India State of Forest Report 2011.

63. The forest cover map of Assam is presented in **Figure 4.5**. The proposed subproject activities in expansion part of Output 1 are located in the following districts: i) Kamrup Metro (new 33/11 kV substation); ii) Sivasagar (new 33 kV lines of total length of 44 km); and iii) Barpeta (new 33 kV lines of total length 75.5 km). These subproject activities do not encroach any forests and are situated in non-forest areas. There is no re-routing of existing

power lines proposed for R&M activities in up-gradation part of Output 1. Output 2 does not involve any construction related activities.

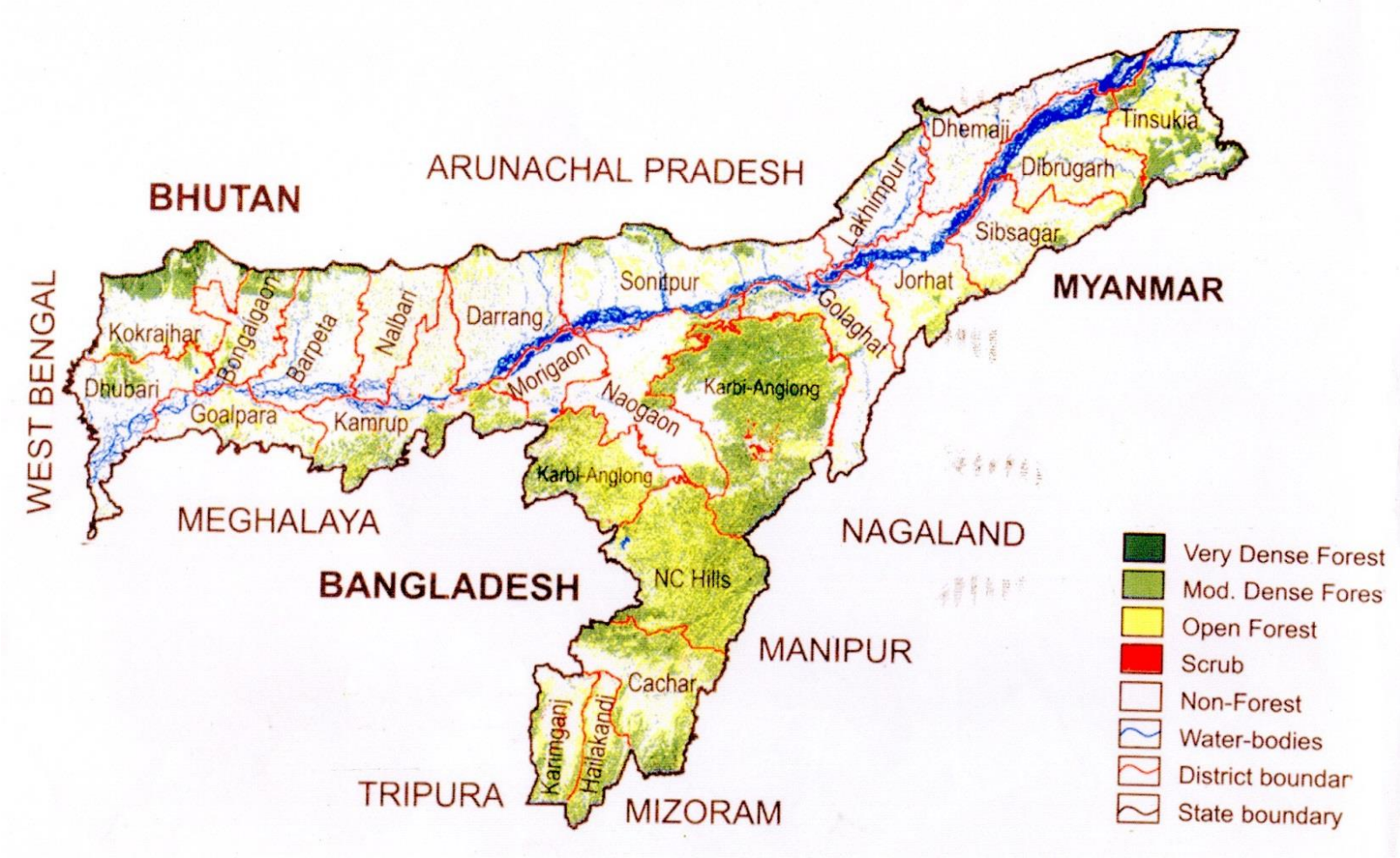


Figure 4.5 District Wise Forest Cover, Assam

4.3.1.2 Fauna

64. Assam is part of the transitional zone between the Indian, Indo-Malayan and Indo-Chinese biogeographical regions. The wet evergreen, semi-evergreen, moist deciduous, wet savannah and riparian forest as well as extensive network of river systems and swamps, marshes and wetlands provide ideal conditions and suitable habitat for sustenance of wide variety of faunal populations.

65. Assam's mammalian diversity is represented by 193 species that are widely distributed in the region. But of late some of the species like the One-horned Rhinoceros, Water Buffalo, Pigmy Hog, Swamp Deer, Golden Langur, and Hoolock Gibbon have their distribution limited to isolated pockets and protected areas. Out of 15 Indian primate species, 9 are found in Assam including the Hoolock Gibbon. The other primate species are the Golden Langur, Capped Monkey, Rhesus Macaque, Pigtail Macaque, Stump-tailed Macaque, Assamese Macaque, and Slow Lorries. The Golden Langur (or Sonali Bandar as it is known locally) is confined between Sankosh river in the west; Manas in the east; Brahmaputra in the south and mountains in Bhutan in the north.

66. The pygmy hog (small wild pig) located at Orang National Park and Manas National Park is considered as critically endangered under the IUCN Red list; the Asssam Roofed Turtle, Hispid Hare, Golden Langur located at Manas National Park are considered as endangered under the IUCN Red List and in India listed in Schedule I of the Indian Wildlife Protection Act of 1972. Assam is one of the "endemic bird areas" in the world. With 950 bird species, Assam is home to 53.5% of the bird species found in the Indian Sub- Continent, 17 species of birds are endemic which include Manipur Bush Quail, Marsh Babbler, Snowy throated Babbler, Tawny breasted Wren Babbler, Blyth's Tragopan, Beautiful Sibia, Grey Sibia, Black Breasted Parrot-bill, Chest runt Breasted Partridge, Rusty Breasted Short-wig 45 species of birds from Assam find mention in the Indian Red Data Book and these include the White Winged Wood Duck, Blyth's Tragopan, Greater Adjutant, Lesser Adjutant, Lesser White-fronted Goose, Merbled Teal, Beer's Pochard, Palla's Sea Eagle, Greater spotted Eagle, Green Peafowl, White Rumped Vulture, Long-billed vulture, etc. The Bengal Florican, located at Manas NP is considered as endangered species under the IUCN Red list.

4.3.1.3 Protected Area

67. Assam has 5 National parks and 18 wildlife sanctuaries, together covering 3,925 km^2 representing nearly 5% of its total geographical area.

68. A map showing the location of national parks and Sanctuaries of Assam is presented in **Figure 4.6.** Tranche 2 subprojects will not affect these national parks and sanctuaries.

69. For instance, the R&M reconductoring of the existing 33 kV line from Mariani to Nakachari (about 3 km out of the total 15 km) runs parallel to the entrance of the Hoollongapar Gibbon Sanctuary (HGS). Previously known as Gibbon Wildlife Sanctuary, it is now called the "Hoollongapar Gibbon Sanctuary" through Notification No. FRP 37/97/20 on 25 May 2004. The HGS, covering a forest pocket of about 21 km^2, is located south of the Brahmaputra River system within Jorhat District near the town of Mariani. In the past, HGS extends up to the Naga Hills and was connected to the Dissoi Valley Reserve Forest, however, the growth of tea gardens caused its detachment from the Reserve Forest area.[44] A Deputy Forest Officer (DFO) of the Wildlife Division is responsible for dealing with

[44] Bhattacharjee, Sujayita . *The scenario of man-elephant conflict in Hoollongapar Gibbon Wildlife Sanctuary of Assam, India.* International Journal of Scientific and Research Publications, Volume 2, Issue 8, August 2012.

maintenance and conservation of HGS, and wildlife-human conflict resolution. There is a Village Protection Committee to support the DFO in implementing measures to deter wildlife from straying into the agricultural areas through constant vigilance especially at night time. In July 2014, the Wildlife Division, through their appointed DFO established a Rapid Response Team to help in situations of conflict between wildlife and humans.

70. HGS and the existing 33 kV Mariani-Nakarachi line is separated by a state-level road (Dhodar Ali). The entrance of HGS is north of Dhodar Ali Road while the R&M activities in this area will be done south of the entrance across the road with a distance of about 1 km. In this area, the project will maintain a vertical ground clearance of about 10 m at the maximum sag condition. Suitable spikes on poles at the height of 1.21 m-2.1 m will be installed to ward off animals that may come close to the distribution poles and damaging them by rubbing their bodies against them, particularly elephants. **Figure 4.7** presents the existing 33 kV Mariani-Nakarachi line.

71. **Table 4.9** presents the details of National parks and the approximate distances from proposed subproject activity in Output 1.

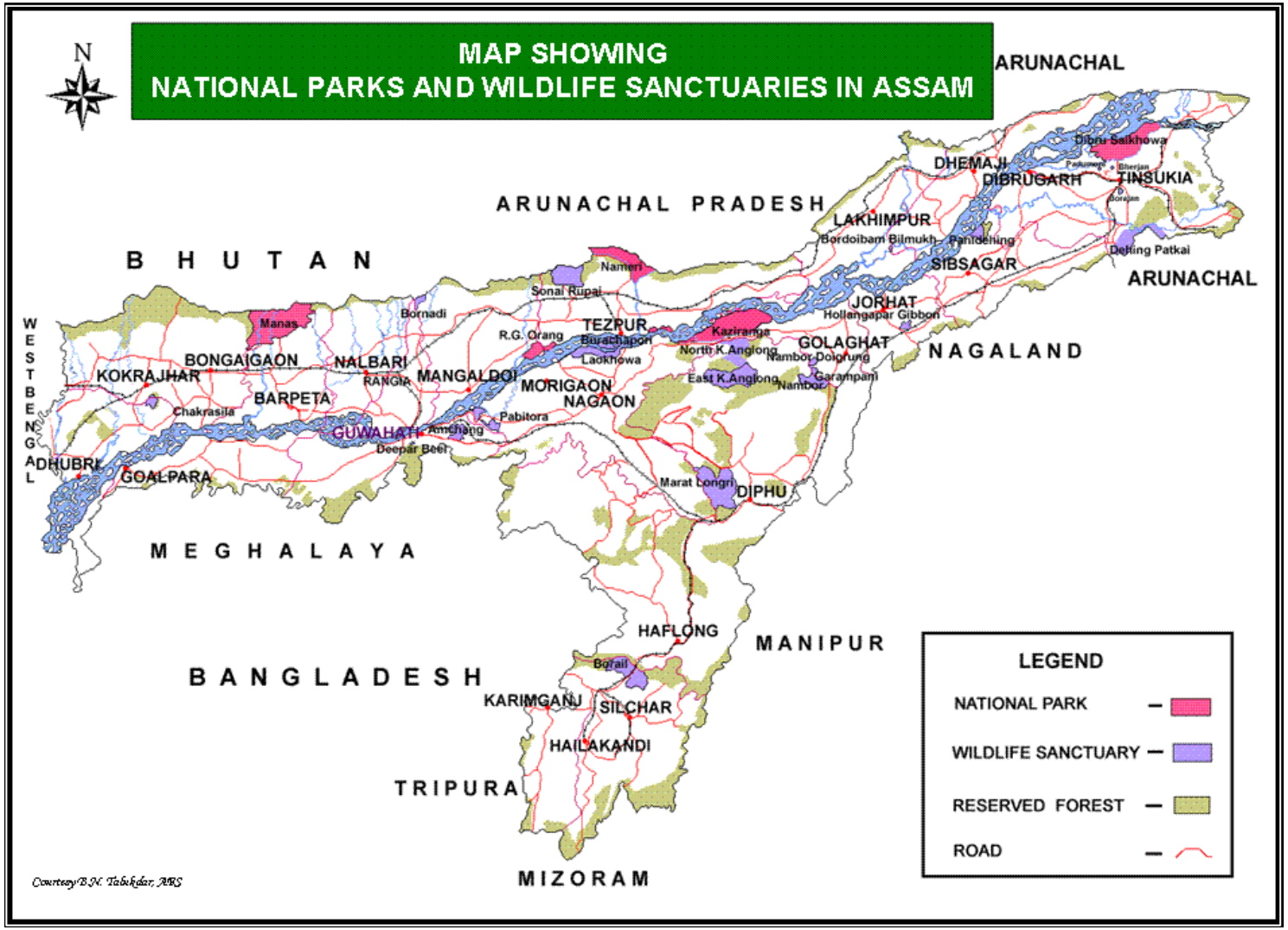


Figure 4.6 National Parks and Wildlife Sanctuaries, Assam

Table 4.9 Details of National Parks in Assam and Distances from New Power Lines

Name of National Park (NP)	Details of National Park	Nearest District	Electrical Circle	New 33 kV lines	R&M existing lines	Approx. Distance of Nearest Town (km)	Approx. Distance of Proposed Activity from NP Boundary (km)
DIBRU-SAIKHOWA	Area - 640 km^2 Established in 1999; IUCN Category II Biosphere reserve	Tinsukia	Tinsukia Circle	x	✓	21 km	44 km to 107 km away from the Park for all 33 kV R&M activity
		Dibrugargh	Dibrugargh Circle	x	✓	40 km	
			Sivasagar Circle	✓		173 km	Note 1.
KAZIRANGA	Area – 471 km^2 Established in 1905; notable for Indian Rhinos and UNESCO World Heritage Site; IUCN Category II Declared as Wildlife Sanctuary in 1940 and as a Tiger reserve in 2006	Golaghat	Golaghat Circle	x	✓	93 km	100 km
		Nagaon	Nagaon Circle	x	✓	104 km	50 - 60 km
MANAS	Area – 950 km^2 Established in 1990; notable for UNESCO World Heritage Site; IUCN Category II	Kokrajhar	Kokrajha Circle	x	✓	122 km	R&M activity on Kokrajha for a length of 5 km and 12 km, respectively. Therefore, not close to the NP
		Chirang	-	x	x		-
		Udalgiri	-		x		-

Name of National Park (NP)	Details of National Park	Nearest District	Electrical Circle	New 33 kV lines	R&M existing lines	Approx. Distance of Nearest Town (km)	Approx. Distance of Proposed Activity from NP Boundary (km)
		Baksa	-	x	x		-
		Udalgiri	-				-
		Bongaigaon	Bongaigaon	x	✓	80 km	
NAMERI	Area – 137 km^2 Established 1978; notable for Tiger Project; IUCN Category II	Tezpur partly covering Nagaon	Tezpur	x	✓	35 km	Note 2.
		Sontipur	Sonitpur	x	x	-	-
ORANG	Area – 78 km^2 Established in 1999; notable for Bird Sanctuary; IUCN Category II	Tezpur	Tezpur	x		32 km	Note 3
		Mangaldoi	Mangaldoi	x	✓	40 km	40 km to 80 km away from the Park for all 33 kV R&M activity

R&M activities on existing lines do not under go any re-routing and do not encroach currently on any Environmentally Sensitive Area including National Parks. No IUCN Level II NP or Sanctuary will be affected by any project activity.

NOTES

1. For Sivasagar Electrical Circle: minimum distance of a proposed line activity is 17 km distance from Pani Dihing Wildlife Sanctuary (New 33 kV Demow to Moran and R&M 33 kV Demow to Moran line)
2. For Nagaon Electrical Circle; minimum distance of proposed line activity is 21 km from Nameri NP (R&M activity on Rangapara line)
3. For Tezpur Electrical Circle: minimum distance of a proposed line activity is 10 km from Orang NP (R&M activity of 33 kV Depota-Dhekiajulifdr)

Figure 4.7 Existing 33 kV line between Mariani and Nakachari, Jorhat Electrical Circle

72. Dibru-Saikhowa National Park is situated in Dibrugarh and Tinsukia district, at a distance of about 12 km north of Tinsukia town covering an area of approximately 640 km^2. It lies between 27°30' N to 27°45' N latitude and 95°10' E to 95°45'E longitude at an average altitude of 118 meters (ranging from 110 meters-126 meters). It is also a biosphere reserve. The park is bounded by River Brahmaputra and Lohit in the north and River Dibru in the south. The Park consists of moist mixed semi-evergreen forests, moist mixed deciduous forests, canebrakes and grasslands. It is the largest salix swamp forest in northeast India. The main attraction at the Park is its White Winged Wooded Duck and Feral Horses.

73. The Kaziranga National Park spans Golaghat and Nagaon districts, at a distance of about 93 km from Golaghat town covering an area of approximately 470 km^2. A portion of the park falls under the Bagori Forest Range and Ghorakati Forest range. The Park established in 1905, is a UNESCO World Heritage Site. It has been declared as a wildlife sanctuary in 1940 and as a Tiger reserve in 2006. The Park harbors the world's largest population of One-horned Rhinoceros as well as Tigers, Elephants, Swamp Buffalo, Swamp Deer, Hog Deer, Barking Deer, Sambar, Hoolock Gibbon, Pythons, Civet Cat, and Wild Boar. There is a rich variety of Fresh Water Fowls, and among 450 species of woodland and grassland birds, it hosts 18 species that are globally threatened. It also contains a breeding population of 35 mammalian species of which 15 are threatened as per the IUCN Red List.

74. Nameri National Park is located in the foothills of the Eastern Himalayas in the Sonitpur District at a distance of about 35 kilometers from Tezpur covering an area of approximately 200 km^2. It is notable for its Tiger Project. The vegetation type is semi-evergreen, moist deciduous forest with cane and bamboo brakes and narrow strips of open grassland along rivers. The forests are also rich in epiphytes, lianas, and creepers and clump-forming bamboo. This Park hosts over 600 species, such as Tigers, Leopards, Sambar, Dhole (the Asiatic Wild Dog), Pygmy Hog, Muntjac, Gaur, Wild Boar, Sloth Bear, Himalayan Black Bear, Capped Langur and Indian Giant Squirrel. The Park also hosts over 300 species of birds such as the White Winged Wood Duck, Great Pied Hornbill, Wreathed Hornbill, Rufous Necked Hornbill, Black Stork, Ibis Bill, Blue-bearded Bee-eaters, Babblers, and Plovers.

75. Orang National Park lies on the north bank of the River Brahmaputra in Darrang and Sonitpur districts at a distance of 32 km from Tezpur and 40 km from Mangaldoi, covering an area of approximately 78.81 km^2. It lies between 26.483°N 92.266°E and 26.666°N 92.45°E. The Park is bounded by Rivers Pachnoi, Belsiri and Dhansiri which all join the River Brahmaputra. Villages encircle the Park area thus subjecting it to some biotic pressure. The Park hosts the Great Indian One-Horned Rhinoceros, the Royal Bengal Tiger, Asiatic Elephant, Pygmy Hog, Hog Deer and Wild Boar. The Park is home to a variety of migratory birds, water birds, predators, scavengers and game birds.

76. Manas National Park is located in the foothills of the Himalayas at a distance of 80 km from Bongajgaon, covering an area of 950 km^2. The Park falls into five districts: Kokrajhar, Chirang, Baksa, Udalguri, and Darrang. The River Manas follows through the Park. It is notable for its UNESCO Natural World Heritage status as well as being a Project Tiger Reserve, an Elephant Reserve and a Biosphere Reserve. The Park is hosts a range of endangered species such as the Assam Roofed Turtle, Hispid Hare, Golden Langur and Pygmy Hog. The Park also hosts Asian Elephants, Indian Rhinoceros, Gaurs, Asian Water Buffaloes, Barasingha, Indian Tigers, Leopards, Clouded Leopards, Asian Golden Cat, Capped Langurs, Golden Langurs, Assamese Macaques, Slow Loris, Hoolock Gibbons, Smooth-coated Otters, Sloth Bears, Barking Deer, Hog Deer, Black Panther, Sambar Deer and Chital. A total of 543 plants species

have been recorded from the core zone, and 450 species of birds such as the endangered Bengal Florican. The major other birds include Giant Hornbills, Jungle Fowls, Bulbuls, Brahminy Ducks, Kalij Pheasants, Egrets, Pelicans, Fishing Eagles, Serpent Eagles, Falcons, Scarlet Minivets, Bee-Eaters, Magpie Robins, Pied Hornbills, Grey Hornbills, Mergansers, Harriers, Ospreys and Herons.

77. Wildlife Sanctuaries: The following are classified as wildlife sanctuaries in Assam: Pobitora, Sonai Rupai, Bura Chapori, Laokhowa, Pobha or Milroy, Chakrashila, Bornadi, Garampani, Hoollongapar Gibbon, Nambor, East, Karbi Anglong, Panidihing, Deepor-beel, Bordoibum Beelmukh, Berjan-Borajan-Padumoni, Morat Longri, and Amchang.[45]

4.3.2 Aquatic Ecology

78. The two major river systems of Assam; the Brahmaputra River and the Barak River, and in the flood plains of these river systems exist patches of marshy depressions and swamps as well as perennial water bodies of varying shape, size and depth called locally as beels, haors, jalah, doloni, hola, pitoni, etc. More than 100 aquatic species have been identified and are described into following broad categories.[46]

- Free floating hydrophytes: Eichhornia cressipes, Pistia stratioles, Lemna mino etc.
- Suspended submersed hydrophytes: Ceratophyllum demersum, Utricularia gibba etc.
- Anchored submerged hydrophytes: Hydrilla, Potomogeton, vallisnaria etc.
- Anchored hydrophytes with floating leaves: Nelumbo, Euryle etc.
- Anchored hydrophytes with floating shoots: Ludwigia, Ipomea etc.
- Emergent amphibious hydrophytes: Sagittaria, Scrirpus.
- Wetland hydrophytes: Cyperus, Hygrophylla etc.

[45] http://www.assaminfo.com/
[46] Department of Environment and Forests, GoA; http://assamforest.in/environment/environment.php

79. The marshy depressions and swamps (Beels) provide very conducive habitat for an array of fish species as well. Assam is recognized as one of the hot spots of fresh water fish biodiversity, with 185 species reported from Assam. However, over exploitation poses a threat to fish diversity. The important ornamental fish species are colisa, Nemacheilus, Danio, Botia and Chaca. Commercially important fish species include, Rohu, Ktla, Pabha, Pabda Chital, Magur, Singi, Sol, etc.

4.4 Socio-Economic Profile

80. **Demography**: As per the Census, 2011, the population of Assam is 31.17 million, with a population density of 397 persons per km^2. Rural and urban population accounts for 85.92% and 14.08%, respectively. Of its 27 districts, Kamrup Rural and Metropolitan are the most populous accounting for nearly 8.92 % of its total population.

81. **Economy:** Agriculture sector (including tea production) accounts for 40% of the GDP with net cultivated area of Assam approximately 0.28 million hectare (2009-2010) or approximately 88 % of the total land available for agricultural cultivation. **Table 4.10** presents the agricultural activity in Assam for 2011-2012.[47]

Table 4.10 Area, Production and Productivity of Crops (2011-2012) in Assam

S. No.	Crop	Area (million ha)	Production (lakh MT)	Productivity (kg/ha)
1	Rice	2.545	50.45	1986
2	Wheat	0.040	0.49	1209
3	Maize	0.021	0.17	802
4	Other Cereals & Small Millets	0.004	0.02	511
5	Blackgram	0.054	0.30	556
6	Greengram	0.012	0.06	551
7	Lentil	0.023	0.12	523
8	Pea	0.021	0.14	641
9	Arahar	0.006	0.04	784
10	Gram	0.002	0.01	524
11	Other Pulses	0.015	0.09	606
12	**Total Pulses**	**0.132**	**0.76**	**579**
13	**Total Food grains**	**2.742**	**51.89**	**1914**
14	Rape & Mustard	0.248	1.39	559
15	Sesamum	0.012	0.08	674
16	Linseed	0.007	0.04	567
17	Castor	0.001	0.01	556
18	Niger	0.008	0.04	519
19	**Total Oilseeds**	**0.276**	**1.56**	**565**
20	Jute	0.066	1.09	1669
21	Mesta	0.005	0.05	1023
22	Sugarcane	0.028	10.53	37055
23	Fruits	0.136	17.14	12600
24	Spices	0.098	2.48	2535
25	Potato	0.098	6.83	6978
26	Vegetables	0.266	46.20	17368

Source: Statistical Handbook of Assam 2011

[47] http://www.agriassam.in/agriHorti_profile/Profile%20of%20Agri-Horti%20Sector%20of%20Assam-February%202013.pdf

82. **Industries:** Tea gardens occupy an area of about 271,768 hectares, with over 43,293 tea estates. Assam contributes 15.6% towards world's tea production. **Table 4.11** presents the tea production from 2001 to 2008. The other industries are crude oil and natural gas production, petrochemical exploration, and tourism. Currently, Assam has four oil refineries as well as public sector fertilizer factory at Namrup.

Table 4.11 Tea Production in Assam and India

Year	No. of Tea Gardens		Area under Tea (in'000 hectare)		Total Tea Production (in 000 kg.)		Average yield (kg/ hectare.)	
	Assam	India	Assam	India	Assam	India	Assam	India
2001	40,795	116,659	269	510	453,587	853,923	1,685	1,675
2002	43,272	127,801	271	516	433,327	838,474	1,601	1,625
2003	43,293	129,027	272	520	434,759	878,129	1,601	1,690
2004	43,293	129,027	272	521	435,649	892,965	1,603	1,713
2005	49,102	140,712	301	556	487,487	945,974	1,622	1,703
2006	-	-	312	567	502,041	981,805	1,610	1,732
2007	-	-	321	578	5,111,885	986,427	1,593	1,705
2008 *	-	-	322	578	487,497	980,818	1,513	1,693

*Area, production and average yield estimated, subject to revision
Source: Economic Survey, Assam (2011-2012), Tea Board of Assam

83. **Public Health, Water Supply and Sanitation:** Assam ranks low in terms of accessibility and availability of safe drinking water supply compared to the national average. Majority still depend on water from rain, streams and rivers for drinking and other domestic and agricultural purposes. The population in Assam with access to safe drinking water is only 77.55% compared to an all India figure of 88% (the same is 84% in rural areas and 95% in urban areas) while the total sanitation coverage (rural plus urban) in Assam is 15 % compared to the national sanitation coverage of 18%. The unhygienic situation and practices in Assam, especially by the disadvantaged section of the society, have caused heavy pollution of the available water sources, soil, and air. The Assam Public Health Engineering Department has identified 4 thrust areas for better outreach in water supply and sanitation. These are (i) Ensuring Access to Safe Water; (ii) Promoting Environmental Sanitation; (iii) Reforming Water Supply and Sanitation Sector; and (iv) Creating Opportunities for Youth Involvement**.**[48] There are various programs under each thrust area and there has been variable progress through the introduction of pilot projects. Some pilot projects include the introduction of total sanitation campaign in select districts under the Reforming Water Supply and Sanitation Sector thrust area, identifying water supply coverage problem for villages and habitations under the Ensuring Access to Safe Water thrust area.[49]

84. **Healthcare Services:** The National Rural Health Mission (NRHM) Assam chapter was started in 2005 and since then the State has come up with various innovations in an effort to promote its health care services to the population. Some of which are Rural Health Practitioners (RHP), Boat Clinic, Boat Ambulance, Mobile Medical Unit (MMU), ASHA Radio Program, Sarathi-104 (Health information helpline & Complaint Redressal system), Riverine Hospital, Operation smile (free surgery for children with cleft lip and cleft palate), free operations for children with Congenital Heart Disease, Susrusha- financial assistance for kidney transplantation, Sanjeevani (Village Health Outreach Program), and NCD (national program on

[48] http://aphe.gov.in/(S(12ykon45mck54gj3pwtppnq5))/Thrust_Areas1.aspx
[49] http://aphe.gov.in/(S(1a3m1dycl2l0w2fxcregueew))/Thrust_Areas1.aspx

prevention and control of cancer, diabetes, cardiovascular disease, stroke etc.), etc. **Table 4.12** presents the list of health care facilities in Assam.[50]

Table 4.12 Health facilities in the Districts of Assam

S. No	District	Type of Public Health Infrastructure						
		Medical College	DH	SDCH	CHC	PHC	SC	Total No. of Health Institutions (Public)
1	BARPETA	1	1	1	6	50	264	323
2	Baksa	0	1	0	4	39	157	201
3	BONGAIGAON	0	1	0	2	30	57	90
4	Cachar	1	1	0	1	30	270	303
5	CHIRANG	0	1	0	2	25	83	111
6	DARRANG	0	1	0	4	30	170	205
7	Dhemaji	0	1	0	3	21	98	123
8	Dhubri	0	1	1	6	43	246	297
9	Dibrugarh	1	0	0	5	25	231	262
10	Goalpara	0	1	0	2	41	151	195
11	Golaghat	0	1	1	4	40	144	190
12	Hailakandi	0	1	0	2	12	105	120
13	Jorhat	1	0	2	4	42	144	193
14	KAMRUP(METRO)	2	1	0	3	25	51	82
15	KAMRUP	0	1	1	9	70	280	361
16	Karbi Anglong	0	1	1	5	47	152	206
17	Karimganj	0	1	0	2	27	221	251
18	Kokrajhar	0	1	1	4	45	159	210
19	Lakhimpur	0	1	1	5	28	156	191
20	Morigaon	0	1	0	2	33	123	159
21	NAGAON	0	1	0	11	74	357	443
22	Nalbari	0	1	0	7	45	121	174
23	Dima Hasao	0	1	0	2	11	65	79
24	Sivasagar	0	1	2	2	42	219	266
25	Sonitpur	0	1	2	3	53	274	333
26	TINSUKIA	0	1	0	5	23	164	193
27	Udalguri	0	1	0	3	24	147	175
GRAND TOTAL		**6**	**25**	**13**	**108**	**975**	**4609**	**5736**

[50]National Rural Health Mission (NRHM), http://www.nrhmassam.in/executive-summary.php DH-District Hospital, PHC-Public Health Center, CHC-Civil Health Center, SDHC-Sub-Divisional Civil Hospital, SD – State Dispensary, SC-Sub center

85. **Employment:** Assam is largely an agrarian state with agriculture sector accounting for 40% of the GDP. The overall unemployment rate of India is 4.7% while the rate of unemployment in Assam is 4.3%.

86. **Education:** The schools and colleges of Assam are either run by the state government or private organization. In 2011, the literacy rate of Assam was estimated to be 73.18% (78.81% male and 67.27% female). The literacy rate of Assam is slightly below the national average of 74.04%.

4.5 Cultural and Archaeological Resources

87. Sivasagar-Earlier known as "Rangpur" is termed as the historical city of Assam. It is situated 363 km east of Guwahati. Sivasagar was the capital of the Ahom dynasty who ruled Assam for more than 600 years before the advent of the British. The most remarkable landscape of the town is the 200 year old Sivsagar tank, situated in the heart of the main town. On the banks of the Sivsagar tanks, are three temples-- the Shivadol, the Vishnudol and the Devidol-- built by Queen Madambika, the wife of Siva Singha, in the year 1734. The Shivadol is believed to be the highest Siva Temple in India, having a height of 104 feet and a perimeter of 195 feet.

88. Joysagar, 5 km off the Sivasagar town, is purported to be biggest man made tank in India with an area over 318 acres. Sivasagar is also famous for 'Talatal Ghar', and 'Rang Ghar'. Rang Ghar amphitheatre was built by King Pramatta Singha. This two storied oval shaped pavilion is one of the largest of its kind in Asia. The main tourist attractions of Sivsagar district are Ranghar, Kareng Ghar & Talatal Ghar, Gargaon Palace, Charaideo, Joysagar Tank, Gaurisagar Tank and Temple, Rudrasagar Tank and Temple, Namdang Stone Bridge and Ajan Pir Dargah Sharif.

89. Charaideo was the first capital of the Ahom kings. It was built by Sukapha, the founder of the Ahom dysnasty, and is located 28 km east of Sivasagar town. It is famous for the numerous Maidums or burial venues of Ahom kings and other members of the royal families.

90. Chariduar, located 34 km north of Tezpur, is famous for forest products exported to various parts of the State. The Boli Pukhuri tank, situated in the Chariduar area is associated with the mythological Kings Boli and Banasur. Remnants of ancient stone temples, built between 11th to 12th centuries are found scattered in and around the area.

91. Da-Parbatia site, which is the oldest relics in the area, is located in the village of Da-Parbatia about 5 km west of Tezpur. The stone door-frame preserved in the village is considered to be from the 5th - 6th century. The door-jumps having goddesses Ganga and Yamuna standing in an artistic pose with garlands in hands. The architecture of the stone door-frame is believed to be of the Gupta era.

92. Garampani is a hot spring situated in Nambar forest reserve in Golaghat district in Upper Assam. The medicinal properties of hotspring are well known. Garampani is 20 km from Golaghat town. Gargaon Palace - Gargaon, the principal town of Ahoms built by the king Suklenmung in 1540, lies 13 km east of Sivasagar town. At one time, it was the principal capital of the Ahom kings. The palace, known as Kareng is a seven-storied brick building and was built in 1762 by King Rajeswar Singha.

93. **Table 4.13** presents the list of monuments/sites as provided by the Archaeological Survey of India.[51] Tranche 2 subproject activities in district Kamrup, Sibsagar and Tinsukia do not encroach upon these sites.

Table 4.13 Monuments/Sites in Assam

S No	Name of monuments/ sites	Location	District
1.	Cachari ruins, i. A small unfinished dwelling house ii. Baradwari iii. East wall iv. Singh Darwaza v. Temple of Ranahandi and 7&8 two small temples vi. Shan Mandir	Khaspur	Cachar
2.	Idgah	Rangamati Hill	Dhubri
3.	Rangamati Mosque	Rangamati Hill	Dhubri
4.	Sri Suryapahar Ruins	Dasabhuja Devasthan	Goalpara
5.	Monument over the grave of Mr. B.J.Stow	Goalpara	Goalpara
6.	Tomb of Lt. Cresswell	Goalpara	Goalpara
7.	Ancient Caves /tombs	Jogighopa	Bogaigaon
8.	Monoliths, Kasomari Pathar	Kasomari Pathar	Golaghat
9.	Sivadol, Neghriting,	Neghriting	Golaghat
10.	Carvings, Inscriptions and pillar on the	Urvasi Island, Guwahati	Kamrup
11.	Rock-cut sculptures representing Vishnu Janardan	Guwahati	Kamrup
12	Stone inscription inside the "Poa Mecca Mosque"	Hajo	Kamrup
13.	Sri Kedar Temple	Hajo	Kamrup
14.	Sri Genesh Temple, Hajo	Hajo	Kamrup
15.	Sri Kameswar Temple	Hajo	Kamrup
16.	Duargaril a Rock inscription	Kamakhya Hill	Kamrup
17.	Rock-cut figures i. Dancing Bhairava, ii. Figures of Ganesa-2 iii.Figure of Narakasur iv. Four-handed Bhairavi v. Miniature Sikhara Shrine vi. Sivalingas-12, vii. Stone Gateway viii. Two-handed Bhairavi	Kamakhya Hill	Kamrup
18.	Rock-cut temple	Maibong	North Cachar Hill
19.	Two inscribed stones	Maibong	North Cachar Hill
20.	Bolosaon Group monoliths	North Cachar Hills	North Cachar Hills
21.	Derebara Group monoliths	North Cachar Hills	North Cachar Hills

[51] http://asi.nic.in/asi_monu_alphalist_assam.asp

S No	Name of monuments/ sites	Location	District
22.	Khartong Group of monoliths	North Cachar Hill	North Cachar Hills
23.	Kobak Group monoliths	North Cachar Hills,	North Cachar Hills
24.	Group of four Maidams	North Cachar Hills, Charaideo	Sibsagar
25.	Ahom Raja's Palace	Garhgaon,	Sibsagar
26.	Vishnudol, Gaurisagar	Gaurisagar	Sibsagar
27.	Devidol, Gaurisagar	Gaurisagar	Sibsagar
28.	Sivadol, Gaurisagar	Gaurisagar	Sibsagar
29.	Gaurisagar Tank, Gaurisagar	Gaurisagar	Sibsagar
30.	Vishnudol, Joysagar	Joysagar	Sibsagar
31.	Devidol, Joysagar	Joysagar	Sibsagar
32.	Ghanashyam's house, Joysagar	Joysagar	Sibsagar
33.	Golaghar or Magzine House, JoysagarDistrict Sibsagar	Joysagar	Sibsagar
34.	Karengghar of the Ahom Kings, Joysagar	Joysagar	Sibsagar
35.	Ranghar Pavallions, Joysagar	Joysagar	Sibsagar
36.	Sivadol, Joysagar	Joysagar	Sibsagar
37.	Rangnathdol, Meteka	Meteka,	Sibsagar
38.	Vishnudol, Sibsagar	Sibsagar	Sibsagar
39.	Devidol, Sibsagar	Sibsagar	Sibsagar
40.	Eight Cannons of the Ahom period on the bank of the Sibsagar tank, Sibsagar	Sibsagar	Sibsagar
41.	Sivadol, Sibsagar	Sibsagar	Sibsagar
42.	Bordol temple, Bishwanath,	Bishwanath	Sonitpur
43.	Grave of Lt. Lewis Van Sadan, Bishwanath	Bishwanath	Sonitpur
44.	Grave of Lt. Thomas Kennedy, Bishwanath	Bishwanath	Sonitpur
45.	Rock known as "Sakreswar on the Island Umatumani , Bishwanath	Bishwanath	Sonitpur
46.	Rock Known as "Bishwanath" Sivalinga", Bishwanath	Bishwanath	Sonitpur
47.	Dhandi temple, N.C. Kamdayal,	N.C. Kamdayal	Sonitpur
48.	Ruins, Singri Hill	Singri Hill	Sonitpur
49.	Masonry remains on the Bamuni Hills, Tezpur	Tezpur	Sonitpur
50.	Mound and ruins of the stone temple, Dahparbatia,	Dahparbatia	Sonitpur
51.	Rock Inscription on the bank of the Brahmaputra, Tezpur	Tezpur	Sonitpur
52.	Sculptures in the Chummery compound, Tezpur	Tezpur	Sonitpur
53.	Hayagriva Madhava Temple, Hazo	Hazo	Kamrup
54.	Gun of the Emperor Sher Shah , Sadia	Sadia	Tin Sukhia
55.	Two Swivel guns belonging to the Mughal Nawwara, Sadia	Sadia	Tin Sukhia

5. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Criteria for Site and Route Selection

94. In planning for the subprojects in Tranche 2, the following criteria were considered to ensure avoidance and minimization of environmental impacts as follows:

i. APDCL criteria for the optimum site and route selection:

   a) Avoidance of forests, national parks, reserves, sanctuaries, or critical habitat;
   b) No infringement with area of natural resources, wetlands, marshes;
   c) Avoidance of areas with any monument of cultural, archaeological, or historical importance;
   d) Public utilities like schools, hospitals, playgrounds are not affected;
   e) No uprooting of existing habitation or threat to the survival of any community; and
   f) Avoidance of infringement on populated / cultivated area completely or keep it to minimum.

ii. Strict adherence to the provisions of EARF, and relevant section from the FFA;

iii. Compliance to relevant provisions of Forest Conservation Act 1980, Guidelines for Declaration of Eco-sensitive zones around national parks and wildlife sanctuaries (being implemented by the MOEF);

iv. Guidelines for linear infrastructure intrusions in natural areas from the Wildlife Protection Act 1972 (amended 2010) being implemented by the National Board of Wildlife (NBW);

v. Reference to relevant GoI standards and codes (e.g., IS 5613-1995 Part II, IS: 3072-1975, etc.);

vi. Reference to relevant provisions in the WB EHS Guidelines 2007 and the sectoral Guidelines for Electric Power Transmission and Distribution (2007).

95. As a result of careful planning, no subproject in Tranche 2 is located near or adjacent to environmentally-sensitive areas. There are no known migratory bird species that will be impacted by the low 7-10 meter high distribution lines. Specific conditions to ensure that potential environmental impacts are mitigated will be included in the Tender Documents.

5.2 Planning and Pre-construction Stage

96. Appropriate survey methods and good engineering practice have been used to select the optimum site and route alignment. However, residual impacts associated with project activities cannot be entirely avoided that may result from topographical variations along the route that will be traversed by interconnecting distribution lines. An EMP and an EMoP will help ensure that these residual impacts are mitigated and/or enhanced (see Section 9 for details).

5.2.1 Location and Design of Substation

97. At the Kharghuli site, a new 33/11 kV substation (capacity 2 x 5 MVA) will be constructed together with the 4 km of 33 kV distribution line and 6 km of 11 kV distribution line. The total area of the site is 4.3 ha and is owned by the Guwahati Metropolitan Departmental Authority (GMDA). Only 0.13 ha will be required by the new substation. A Japan International Cooperation Agency-funded Guwahati Water Supply project is also in the site. APDCL has obtained a letter from the GMDA recommending the allotment of land (plot no. 523) for APDCL use on 1 February 2013 and "request to proceed" letter from PMU of JICA on 29 October 2014.

98. There is an existing unpaved approach road to the site which will be upgraded into a paved road during the commencement of civil works for better access. The boundary of the proposed substation will be 60 m away from the embankment of Brahmaputra River, with a drop of approximately 4 m to the river bed. Although breach of embankment is not anticipated, the highest flood level will be considered in the location and design of the substation.

99. The site has an inclined slope on its northern side and contains an old Neem tree (which has medicinal properties) on the north-east side. No hill leveling or tree cutting/lopping will take place. Plot no. 523 allocated for the substation may require controlled backfilling. The site has two permanent households (thatched huts) situated at the top of the slope, approximately 50-60 m from the proposed substation boundary. Although these households are on GMDA land, there will be no displacement (including of any non-titled dwellers) involved due to construction activities. As a safety measure, adequate distance will be maintained between the substation boundary and the households following the ROW.

100. Design and location of the substation and transformers will be planned such that noise, dust, or vibration will not be a nuisance, and water and soil quality will not affected.

5.2.2 Route Selection for New 33 kV and 11 kV Distribution Lines

101. The walkover survey/transect (which involves setting up of temporary tracks) helps determine the type of vegetation, type of structures and settlements within the road easements as well as the natural and physical features along the route and public utilities that may be traversed by the new distribution lines. Walkover surveys may cause short and temporary disturbance to the local people within the ROW.

102. Informal consultations with potentially affected persons will be conducted to apprise them of the APDCL intent and advise the community about the type, location and scale of the subprojects including the benefits from the entire project. Persons that may be affected will be compensated based on entitlements following the national laws and SPS 2009.

5.2.3 Choice of Technology

103. Significance of potential environmental impacts is affected by the choice of technology. Potential release of chemical and toxic gases and generation of noise and vibration could be some of the associated impacts due to inappropriate technology selection.

104. For Tranche 2, the Kharghuli site will have a conventional type substation, utilizing vacuum circuit breakers and/or SF_6 circuit breakers. About 204 existing oil-filled distribution transformers (DTR) will be replaced with dry-type DTRs to reduce the risks to fire hazards in busy places. In all the equipment that will be procured or installed for the subprojects of Tranche 2, specifications and/or guaranteed emissions will comply with relevant standards of World Bank (WB) Environment, Health and Safety (EHS) Guidelines 2007 and CPCB/PCBA environmental standards. These specific conditions of compliance will be included in the Tender Documents.

5.3 Critical Environmental Screening Criteria

5.3.1 Loss of Irreplaceable Resources

105. Components 1 and 2 will not involve any large-scale excavation or land acquisition. Component 3 does not involve any construction related activities. There are no trees within the Kharghuli substation site that will be cut and no trees are anticipated to be cut along the ROW of the new 33 kV and 11 kV distribution lines. Tree tops may be trimmed to maintain the required clearance. There will be minimum and targeted vegetation clearing without chemical use in preparing the base for the poles/towers. The environmental management plan (EMP) includes compensation for any crop damage and loss of agricultural asset (if any) based on entitlement matrix following national laws and SPS 2009. Replanting will be of native species to minimize loss of vegetation, if any.

5.3.2 Accelerated Use of Resources for Short-Term Gains

106. The project will not utilize any natural resources of the area during construction, operation and maintenance phases. Construction materials such as concrete mixers, gravel and sand, panels, panel mounts, steel, cement, etc. shall be procured from vendors and factories. Excavated soil shall be utilized for backfilling to restore the surface area.

5.3.3 Endangering Species

107. No endangered species of flora and fauna or those included in the IUCN Red List exist within the areas that will be affected by Tranche 2. Following the APDCL selection criteria, EARF and relevant provisions in the FFA, no environmentally-sensitive area (ESA) will be affected by any subproject. No IUCN Level II national park or sanctuary will be affected by any project activity.

5.3.4 Promoting Undesirable Rural to Urban Migration

108. The project will not involve land acquisition of any private land holdings or uprooting of habitation (including untitled land holders). Thus, the project is not expected to cause any loss of land holdings that normally trigger migration.

5.4 Construction Stage

109. During the construction stage, activities will include the substation works at Kharghuli site, transport of material and equipment to the work sites, excavation and/or backfilling for substation, vegetation clearing/trimming of ROW along the new 33 kV and 11 kV lines, setting up of temporary access tracks, paving the access road, breaking of paved roads for underground (UG) cabling, setting up of materials storage areas along the route, installation of poles, and stringing of conductor both for new lines and existing 33 kV and 11 kV lines included for R&M. These project activities have associated environmental impacts that require mitigation measures.

5.4.1 Workforce Organization and Orientation

Preparation of Construction Management Plan

110. The construction management plan (CMP) will help to avoid unplanned activities of EPC Contractor(s) and will guide the smooth implementation of earth-moving works, civil and electrical works. The CMP will cover temporary community/pedestrian safety, traffic management, workers' safety, detailed fire safety, spoils or muck disposal, noise and dust control, accidental drainage (sewerage and/or water spill), storm water management, material management, and waste management addressing both solid and liquid waste The CMP will also include designate areas for monitoring such as workers' facilities, work areas, and materials warehouse/storage.

111. The Engineering, Construction and Procurement (EPC) Contractor(s) will adhere to the CMP and will ensure that after completion of work, they will rehabilitate and clean up all the work sites.

Hiring Of Project Staff and Workers

112. The implementation of the subprojects included in Tranche 2 will be opportunities for local employment. While this is beneficial, it may also be a cause of conflict due to migration of workers and dispute over transparency of hiring particularly if migrant workers are recruited over local people. The EPC Contractor(s) will use local labor for manual work and eligible local workforce for technical and administrative jobs. The PMU will monitor compliance of EPC Contractor(s) to local hiring.

Orientation for EPC contractor(s) and Workers

113. The PMU will conduct briefing and/or orientation for EPC Contractor(s) on EMP, grievance redress mechanism (GRM), public consultation, and reporting. This will provide an understanding of their responsibility in implementing the CMP and compliance to the EMP as well as agreement on critical areas that needs monitoring. The briefing will also include strict compliance against child labor, bonded or forced labor, and awareness of health and hygiene at work sites as well as socially transmitted disease such as HIV/AIDS to prevent potential incidence. Aside from Relevant National and State labor regulations, ADB's core labor standards will provide guidance for compliance. EPC Contractor(s) will provide hired workers training/drills on safety, risks, and emergency preparedness before start of any civil works.

114. The orientation will help in creating awareness on the potential man-wildlife conflict along the existing 33 kV line from Mariani-Nakarachi. About 3 km of the existing 33 kV Nakarachi-Mariani line runs parallel to the entrance of HGS (see **Figure 4.7**). A staff from the National Board of Wildlife, MOEF (or Deputy Forest Officer) and a representative from the Village Protection Committee from Mariani, Nakachari, Dihingia Para Grant, or Chintali Gaon can be invited as resource persons on man-wildlife conflict and how to resolve them.

Presence of Workers at Construction Sites

115. The presence of workers and staff at the new 33/11 kV Kharghuli substation site may increase demand for services such as food and beverages. The site has a permanent structure to house workers and there are available sanitary facilities. The localized demand of services may result in an opportunity for local people to set up temporary small-scale business in

providing food, beverages, and tea outside the substation site. This will be a beneficial impact to local economy.

5.4.2 Site preparation and Civil Works

Impacts on land and vegetation

116. Kharghuli substation: Site preparation will not involve tree cutting/lopping but will require controlled backfilling to level the foundation. Earthmoving works may cause potential soil erosion. Engineering and biological measures will be implemented to prevent soil erosion such as sow soil binding grass. Spoils disposal plan will be strictly implemented. Landscaping or replanting of vegetation with native species will be done as soon as earthworks are completed to stabilize the soil. EPC contractor will provide a diagram of the site to ensure compliance to the provisions of the EMP. The diagram will specify where the stockpiles are stored and handled, and spoils disposed. It will lay out boundaries, especially in terms of the site / facility's proximity and/or distance from the Brahmaputra river.

117. For any fuels and other lubricants that may be stored at construction sites, best industry practice will be followed to ensure that accidental spills and discharge to soil and water are prevented. Any fuel containing drums or tanks will be placed at least 10 meters away from the River Brahmaputra. The EPC Contractor(s) will ensure that only trained workers will be engaged in handling of such material and any hazardous waste.

118. The substation transformer will be located on an impermeable floor.

119. Highest flood level will be considered in site preparation since the new substation is located near the banks of the River Brahmaputra. The existing approach road will be upgraded for easier access. This will benefit the local community.

120. 33 kV and 11 kV distribution lines: There will be vegetation clearing along the ROW which is 7 m and 15 m for 11 kV and 33 kV, respectively. This will cause some loss of habitat. The loss of habitat due to clearing and stringing of conductors will naturally regenerate in about 2-3 years.

121. Site preparation will require minimal earthworks involving small-scale excavations and the excavated topsoil will be used for backfilling. Highest flood level will be considered in site preparation for the B+ tension tower at River Beki crossing (0.35 km) for the 33 kV line between Barnagar grid substation (GSS) and Howly (20 km). This line will be single span across Beki River and will not require any footings on the river.

122. For distribution poles/towers, only the exact amount of construction materials (i.e., sand, gravel, concrete, etc.) will be brought on-site to avoid stockpiling that may cause localized flooding during the monsoon season and to minimize any inconvenience to local people.

123. Construction works will be scheduled to avoid farming or harvesting season, as far as practicable, to minimize crop damages. Crops/plantations that may be affected or damaged during erection of poles and stringing of conductors will be compensated based on entitlements in Schedule of Rates, Assam following the national laws and SPS 2009.

124. R&M of existing 33 kV and 11 kV distribution lines: There will be minimal site clearing for the existing lines included in R&M. Any temporary damage to crops/plants will be compensated

according to entitlements in Schedule of Rates, Assam following the national laws and SPS 2009.

125. Schedule of rehabilitation and re-conductoring works of 33 kV Mariani-Nakachari line parallel to HGS will be coordinated with the Deputy Forest Officer and the Village Protection Committee of Mariani, Dihingia Para Grant, and/or Chintali Gaon to avoid man-wildlife conflict in case there will be wildlife crossings. A staff will be designated to monitor traffic along Dhodar Ali Road parallel to HGS and to restrict access of workers to HGS during rehabilitation works.

126. According to the Guidelines for linear infrastructure intrusions in natural areas (Wildlife Protection Act 1972, amended 2010), any line that follows along an animal corridor (which may exist outside the boundary of a protected area), the minimum ground vertical clearance of 6.66 m in plain areas and 9.1 m in steeper terrain will be provided and maintained. Following this requirement, the minimum ground vertical clearance for erection of poles replacement and reconductoring for a total of 5 km along the existing 33 kV Mariani-Nakachari line will be 9.1 m at maximum sag condition.

127. Additionally, the Central Electricity Authority (CEA) guidelines for laying transmission and distribution lines of 33 kV and 11 kV voltage in areas critical from the point of view of saving wildlife requires the provision of suitable spikes on 11 kV and 33 kV poles at the height of 1.21 m and 2.1 m, respectively to ward off animals coming close to the poles and damaging them by rubbing their bodies against them, particularly elephants. Such poles shall be provided and maintained along the 5-km existing Mariani-Nakachari 33 kV line parallel to HGS.

128. **Replacement of overhead lines with UG cabling**: Existing roads in and around Guwahati City, Dispur and Paltan bazar to Ganeshguri will be trenched in a phased manner at 30-m section intervals to minimize disruption and reduce inconvenience to surrounding areas. Only the exact amount of construction materials will be brought on-site to avoid stockpiling. Debris from trenching will be hauled to designated dumping area and/or landfill sites. The affected road will be re-paved after completion of trenching activities.

Impacts on People

129. **Workers Safety:** EPC Contractor(s) will comply with relevant safety measures required by law and best engineering practices. R&M activities will require dismantling of existing oil-filled DTR, installation of new dry-type DTR, dismantling of poles and equipment, erection of new poles and re-conductoring/refurbishment.

130. Workers will be provided with proper safety clothes and protection gear/equipment to avoid accidents. The Kharghuli substation site has an existing permanent structure to house workers and sanitary facilities. EPC Contractor(s) will ensure that sanitary facilities are in good condition, wash areas are clean, safe drinking water is available, garbage bins provided in designated locations, and good housekeeping is observed at all times in the work sites. These will be monitored by the PMU of APDCL.

131. Designated staff will be provided with communication device to facilitate communication particularly during emergency. EPC Contractor(s) will find the location of the nearest hospital, and coordinate with the hospital for arrangements in case of accidents and emergencies at the worksites. First aid treatment will be set up within the construction sites and field offices. The EPC Contractor(s) will conduct a health and fitness check on its workers once every two

months. Appropriate grounding and deactivation of live power on existing lines will be ensured prior to any R&M works.

132. **Waste Generation:** There will be debris and scrap materials from construction works, trenching, R&M and dismantling activities (such as worn out poles and conductoring material). Construction debris and waste from trenching will be transported to designated dumpsites or landfill while scrap materials from R&M and dismantling activities will be transported to Central warehouses located in Guwahati and Jorhat/Divisional stores under each Electrical Circle. Divisional stores are dedicated storage yards, for resale and auction to authorized dealers. Similarly, servicing and/used transformer oil (if any) will be disposed of/sold to Government-registered recyclers only as set forth by the Hazardous Waste Management and Handling Rules 2008.

133. **Public Safety:** The installation of distribution poles/towers, stringing of conductors, and trenching activities (for UG cables) may potentially interfere with road crossings and flow of traffic. This may pose safety risks to the public. Stringing of conductors will be done following relevant Indian standards which are consistent with IEEE and IEC standards. Railway crossings for new 33 kV lines will not cause disruption to movement of trains or public.

134. EPC Contractor(s) will observe and implement the CMP for temporary community/pedestrian safety and traffic management plan and will instruct drivers of construction vehicles to strictly follow road regulations. To minimize the risks, adequate and clearly visible warning signs (such as danger, detour, cross here, works in progress, people at work, etc.) will be posted at designated sites while scaffoldings will be placed over road crossing points. Security personnel will be assigned to prevent trespassing and accidents at the substation site.

135. A 24-hour advance notice shall be provided to the affected stakeholders for interference to existing utilities (e.g., power outages during interconnection of distribution lines, replacement of DTR, or temporary closing of water supply). The required machinery for trenching activities will be brought on site and removed at the end of the day (if possible) to reduce obstruction to traffic flow.

Impacts on Air Quality, Noise, and Vibration

136. Vehicular emissions from the use of heavy equipment and construction vehicles, land clearing, road breaking/trenching, earthmoving works, and transport of construction materials may increase levels of suspended particulate matter affecting air quality. Opened and exposed land areas at the Kharghuli substation site, along the new 33 kV and 11 kV distribution lines, and UG cabling will be sprayed with water to suppress dust level particularly during the summer season. Aside from this, construction sites at the substation and specific sections for trenching will be temporarily enclosed to control dust level. Storage area/warehouse for materials needed for construction works will be provided onsite to reduce the trips of transporting materials and minimize stockpiling. Construction vehicles transporting materials that generate dusts will be covered with tarps.

137. EPC Contractor(s) will be required to maintain construction vehicles regularly to minimize the contribution of vehicular emissions to poor air quality. Moreover, drivers will be required to observe low speed wherever necessary and no blowing of horns.

138. The use of heavy equipment, construction vehicles and civil works may increase the noise levels (such as during excavation works at the substation site and trenching activities) and may cause vibration. Increase in noise levels and potential vibration may inconvenience local people and commercial properties in and around these sites. As required by CPCB guidelines, noise-generating activities will be scheduled between 7AM and 7PM while noise-generating machineries and construction areas will be covered with acoustic screens and/or temporary enclosures.

139. Since trenching activities are scheduled to take place in high density commercial area, special permission will be required for night time construction activities. Since this is zoned as a commercial area, there are no residential homes or flats or prescribed "Silent Zones" in or nearby the vicinity.

Impacts on Water Quality

140. Presence of workers at construction sites will generate sewage that may affect water quality while earth moving works may cause localized flooding during monsoon season and in other low-lying areas.

141. There are sanitary facilities already available at the Kharghuli substation site. EPC Contractor(s) will ensure that these facilities are in good working condition. If not, portable toilets will be provided and replaced with clean units regularly.

142. The site selection of subprojects avoided waterways to minimize the associated environmental impacts. There will be no impact to any aquifer systems or to water table below the ground surface such as due to oil spillage from construction equipment. EPC Contractor(s) will strictly adhere to the plan for oil spill prevention and emergency response of APDCL. No footing of towers will be placed on a water body. To avoid localized flooding, construction works will be scheduled during non-monsoon period in areas prone to flooding. During the monsoon season, drainage and storm-water management plan will be implemented by the EPC Contractor(s), as needed. Water quality testing will be conducted at the substation site once prior to start of the civil works, once during construction stage, and once after completion of work.

5.5 Operation Phase

5.5.1 Use of mineral oil

Impact on Land and Vegetation

143. Dismantling of oil-filled DTRs may cause potential accidental spillage of mineral oil that may contaminate land and water. Dismantling process will follow manufacturers' specifications and EPC Contractor(s) will strictly adhere to the plan for oil spill prevention and emergency response of APDCL. The dismantled DTR will be transported and stored in designated Central warehouses in Guwahati and Jorhat/Divisional Stores under each Electrical Circle. The storage area for dismantled DTRs will have impermeable floor on a bunded area of 110% volume.

Impacts on People

144. Use and handling of mineral oil for DTR may pose occupational and health risks to workers. Delivery and acceptance of mineral oil will be accompanied by material safety data

sheets and/or be certified that it is polychlorinated biphenyl-free (PCB). India has never produced PCBs and its importation has been banned 1998.

145. Fire extinguishers will be posted at designated locations in the storage areas for mineral oil. Workers will be provided with training on emergency oil spill and preparedness.

5.5.2 O & M of substation and distribution lines

Impacts on Land and Vegetation

146. **UG cabling**: The replacement of overhead HT and LT lines in and around Guwahati city will enhance the aesthetic feature of the commercial district and reduce safety-related risks to the public.

147. **Use of SF_6 and lubricants**: Fugitive emissions of SF_6 will be monitored following protocols consistent with the Institute of Electrical and Electronics Engineers (IEEE) and International Electrotechnical Commission (IEC). Annual inventory on the use of SF_6 will be conducted to monitor usage and losses, and measurement by hand held devices will be conducted on quarterly basis. A very high grade sealing system and erection methodology will be followed to keep the loss of SF_6 within 0.1% every year. SF_6 gas handling system for evacuation and storage will always be used for the maintenance of the circuit breaker. Relevant standards from the WB EHS Guidelines 2007 and CPCB on handling SF_6 and other hazardous materials will be complied with. EPC contractor will provide measures to adhere to guidelines for proper handling of SF6 at the substation site to avoid any untoward incidents.

148. Any fuel and other lubricants that may be stored at the Kharghuli substation will be stored away from the boundary close to Brahmaputra River and storage area will have impermeable flooring.

Impacts on People

149. To reduce safety risks, signage meeting the IEEE standards will be placed on all overhead lines to warn the public of electrical hazards. The distribution lines are designed to have ground wire spacing and lightning arresters as safety features following the Indian Standards consistent with IEEE and IEC standards and these will be complied with by APDCL at all times. There will be regular monitoring and maintenance to ensure safety and integrity of power lines and substation.

150. The Kharghuli substation will be equipped with protection system that shuts off during power overload and similar emergencies. UG cables will be properly insulated following industry standards and trenched areas will be covered to minimize hazards.

151. Security and inspection personnel will be deployed to avoid vandalism of equipment and pilferage of lines/cables which may cause accident and/or electrocution.

152. Operation of noise-generating equipment (such as transformers) will be enclosed and periodic maintenance of equipment such as transformers will be conducted. Due to the close proximity of dwellings within the substation site, noise level measurements will be conducted regularly to ensure that ambient noise level standards are complied with.

153. Safety gear for workers working at height for operation and maintenance will be used to minimize risks of accidents. Maintenance workers/linemen will be provided with safety clothing and other working gears for protection. Regular training on safety and emergency preparedness will be conducted to ensure that best practices are incorporated in the Safety Plan. Only trained workers will be engaged in handling of any hazardous material (and waste).

154. Information drive to affected stakeholders/dwellings within and around the project activity area will be conducted prior to commissioning to create awareness on safety practices (e.g. adjacent to Kharghuli substation, selected sections along the distribution lines, etc.).

Impacts on Wildlife

155. Ocular inspection/spot checks of wildlife crossing particularly along the 33 kV Mariani-Nakachari line parallel to HGS. Regular coordination with the Deputy Forest Officer in HGS and Village Protection Committee will be done to explore possibilities of supporting their efforts to prevent man-wildlife conflicts and accidental wildlife deaths.

6. ANALYSIS OF ALTERNATIVES

6.1 Site and Route Selection

156. The following points were taken into consideration in site and route selection:

i. Avoid Environmentally Sensitive Areas (ESA) that include National Parks, Wildlife Sanctuaries, Bio-reserve zones, Eco-Sensitive Zones, or wetlands as declared by GoI and areas declared as heritage sites;

ii. Does not create any threat to the survival of migratory species/birds or interfere in breeding;

iii. Avoid areas of high density of trees; ensures minimum and targeted vegetation clearing and replanting after completion of works with native species;

iv. Avoid agricultural land and/or tea plantations, when it is not possible select a route that causes minimum damage to existing land and/or plantation;

v. Avoid flood prone and/or unstable areas;

vi. Non-interference to natural flow paths, rivers and irrigation channels;

vii. Construction activities do not adversely affect the population living near the proposed substation site and distribution lines;

viii. Construction activities do not adversely affect the commercial businesses/properties or cause interference to existing utilities (power outage, drainage systems, traffic flow, pedestrians, etc.) near the proposed site for UG cabling;

ix. Adequate planning for noise control, dust suppression, vibration, movement of heavy construction machinery and vehicles; traffic management and interference to existing utilities (power outage, drainage systems, water supply, etc.);

x. For distribution alignments that pass through or alongside any town and /or villages, maintenance of the minimum ROW distance for safety measures;[52]

xi. Does not lead to uprooting of habitations, dwellings, or create a threat to the survival of any community;

xii. Consider non-interference to existing public utility services like playgrounds, schools, or hospitals;

xiii. Undertaking R&M activities on existing 33 kV, 11 kV and LT lines does not involve re-routing and does not disturb the existing environment or keeps it to minimum;

xiv. Consider existing land ownership, avoidance of private land acquisition; and

[52]The ROW depends on the line voltage. As per Forest Conservation Act (1980), the maximum RoW for 33 kV lines on forest land is 15 meters and minimum clearance between conductor and trees is 2.80 meters.

xv. Considers location of existing distribution lines for potential interconnection with the ones proposed.

157. Preliminary site assessment and route selection were based on the interpretation and walk over surveys according to the maps (topographical maps, land use maps, vegetation maps, electrical line diagrams) of the area, which will be taken up for detailed survey and assessment of environmental and social impacts before the start of any civil works.

158. From the outputs of preliminary evaluation, some proposed routes were dropped from further study due to unsuitable terrain, close proximity to populated areas, etc. For example:

- **Output 1**: Proposed 33 kV line from Kamakhaya grid substation (GSS) to Maligaon Railway 33/11kV S/S (4 km) in Guwahati Electrical Circle-II

    - The first option of ROW will require the proposed 33 kV line to go down a steep hilly decline, clearing of vegetation along the decline, across a populated area and a railway crossing that will further require UG cabling, and corresponding permits from the railway authorities.
    - The second option of ROW will follow the road easement with an existing 33 kV line emanating from a 33/11 kV S/S at Kamakhaya (Capacity 2x 5MVA). In this option, the line will be converted from single circuit to double circuit.
    - Keeping in mind the criteria for selection of optimum route, the first option was dropped because of the requirement of permits and clearances, infringement of populated areas, vegetation clearing, and unstable terrain as well as the associated costs.

159. **Appendix 1** presents the project components details while **Appendix 3** presents the locational analysis for the proposed 33/11 kV substation in Kharghuli.

160. **Table 6.1** presents a comparison of a “with project” and a “without project” scenario.

Table 6.1“With” and “Without” Project Scenario

No.	Parameter	With Project Scenario	Without Project Scenario
1	Electricity	Major effect, improved voltage, less fluctuation, increased availability	No effect
Environment			
2	Effect on protected, sensitive, or forest areas	No effect, avoids protected, environmentally sensitive and forest areas	No effect
3	Effect on endangered species	No effect, avoids protected, environmentally sensitive or critical habitat, forest areas	No effect
4	Tree cutting	Minor effect, shall comply with the environmental safeguards provision of the ADB and GoI	No effect

No.	Parameter	With Project Scenario	Without Project Scenario
5	Air emissions	During construction: Increase in air emissions because of construction activities / trenching, dust generation; temporary impact	No issue
9	Water supply	Improved water accessibility for agriculture purposes due to available power	No effect
Social			
10	Disturbances of people/ communities	During construction phase; temporary impact	No issue
11	Effect of business	Construction activities may employ local populace generating economic and livelihood generation opportunities.	No issue
12	Status of living	Improve access to electricity, reduce domestic load for persons such as women involved in cooking activities, accessing water supplies	No change
Economic			
13	Economic development	Greater rate of economic development expected	Slow development

7. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

7.1 Consultation and Participation

161. Initial consultations were done during the site visits from 5 to 8 September 2014 and again from 17 to 30 September 2014. A total of 17 sites were visited.

162. Consultations were attended by members of APDCL such as field officers, Assistant GM and/or Deputy GM, and local public (with total participation of 99 persons). **Appendix 4** presents the photos and the attendance sheets with signatures of stakeholders present during the consultations.

163. Concerns of local people were common and they include: (i) load shedding or prolonged power outage, voltage drop, fluctuations, and the lack of reliable and stable supply of power affecting their businesses, crop production, livelihood and general day to day affairs. Compensation to persons (farmers) affected during construction of substation, erection of the distribution poles and /or stringing of the conductors in the past, was not a concern. Overall, the concerned local people were aware of the proposed project and were supportive due to expected benefits, i.e. availability of a reliable power supply, and potential employment opportunities. No major environmental issues were raised during the consultation process.

164. Consultations with concerned stakeholders in varying degrees will continue throughout the life of the project and will be open and gender inclusive. The consultation process will be undertaken under the direction of ESMU.

7.2 Information Disclosure

165. The proposed consultation plan and corresponding information disclosure during project implementation is presented in **Table 7.1.**

166. The draft IEE will be posted to the website of ADB as required by the SPS 2009 and Public Communications Policy 2011. A project factsheet or FAQ flyer in Hindi and Assamese will be made available at the field offices of the APDCL. Aside from this public disclosure requirement of ADB, the Right to Information Act 2005 of GOI requires APDCL to provide information to the public about the project.

Table 7.1 Public Consultation Plan for Project Implementation

Project Activity	Approach for Consultation	Schedule
Detailed survey (i.e., walk-over) and EPC Contractor	• Informal meetings at different spots along the distribution line route (approximately 20-30 km) • Informal briefing of project to dwellings situated in and around the proposed substation site at Kharghuli • Formal briefing of project via Notice to commercial businesses / properties (for UG cabling) one month prior to any civil works	Pre-construction Stage
Construction works	• Project brief and/or frequently asked questions (FAQs) in Hindi and Assamese to be made publicly available in field offices of APDCL and at the local *Panchayat* office • Village level or local informal meetings as needed • Informal briefing of project to dwellings situated in and around the proposed substation site at Kharghuli and along ROW of new lines • Flyer or information leaflet in Hindi and Assamese on grievance	Construction Stage

Project Activity	Approach for Consultation	Schedule
	redress mechanism to be made available in field offices of APDCL and at the local *Panchayat* office	
Operation and Maintenance works	• Flyers or information leaflets in Hindi and Assamese detailing with project activity and safety issues such as electric and magnetic field, maintenance of ROW, pilferage or theft of power cable, electrocution to be made available in field offices of APDCL and at the local *Panchayat* office • Flyer or information leaflet in Hindi and Assamese on grievance redress mechanism to be made available in field offices of APDCL and at the local *Panchayat* office • Contents of the aforementioned flyers to be relayed verbatim to dwellings situated within the project substation site at Kharghuli in addition to handing over a flyer • Relevant press releases, as and when needed • Response to public inquiries	Operation Stage

8. GRIEVANCE REDRESS MECHANISM

8.1 Awareness of Stakeholders

167. Consultations with potentially-affected persons were conducted in September 2014 before the commencement of any project activity to inform them of the proposed project, potential temporary impacts, and benefits.

168. A community awareness program will be conducted one month prior to construction by the Project Implementation Unit (PIU) of APDCL regarding the scope of the project, procedure of construction activities, utility of resources, identified impacts and mitigation measures, and grievance redress mechanism (GRM). This awareness program will help the community to resolve problems and clarify their distrusts related to the proposed project at the initial stage.

169. Flyer or information leaflet on GRM will be made available in the field offices of APDCL and at the local *Panchayat* office. It will contain details about the procedure for making complaints, including the place and the responsible person to contact for any grievance.

8.2 Current Scenario

170. APDCL has its own process of handling complaints/grievance from their customers about the quality of delivery service. However, it does not include a system or process for receiving complaints or grievances that may be attributed to social or environmental issues. Additionally, ADPCL does not have any environment or social safeguards policy and procedures on the implementation of their distribution projects.

8.3 Need for Grievance Redress Mechanism

171. Since Tranche 2 will be funded by ADB, SPS 2009 requires APDCL to establish a GRM to provide an accessible platform for receiving and facilitating resolution of complaints from affected person on project implementation. SPS 2009 provides that the GRM will address concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate and readily accessible to the affected persons at no costs and without retribution. GRM is normally incorporated in the compensation process due to land acquisition and temporary damages to crops and lands during construction but will also cover issues that may be raised on environmental issues such as increased level of dust and noise causing inconvenience to local people, traffic, or other relevant issues.

172. **Composition:** PMU will set up a Grievance Redress Committee (GRC) as soon as the project commences. GRC will function from construction to operation phase and will be headed by the Project Head, APDCL. Other members will include Sub-district Magistrate/District Revenue Officer or their nominee, representatives from the local Panchayat, EPC contractor, women village council, AGM of ESMU, and a witness of the complainant/affected person.

173. **Responsibilities:** The GRC is expected to: (i) resolve issues on land acquisition (if any), compensation to temporary damages to crops, plants, trees and other use of land such as borrow areas for distribution poles/towers (if needed); (ii) resolve issues on dust, noise, vibration, construction related nuisances to public; (iii) convene once a month to review complaints lodged (if any); (iv) record the grievances and resolve the issues within 30 days from the date the grievance was filed with the ESMU or PIU; and (v) report to the complainant(s) the status of grievance resolution and the decisions made or action taken.

174. **Procedures:** The PMU shall formulate procedures for implementing the GRM while the PIU together with the ESMU shall undertake GRM's initiatives that include procedures of taking/recording complaints, handling on-the-spot resolution of minor issues, and provisions of responses to affected persons paying particular attention to the impacts on vulnerable groups.

175. Minor grievances on compensation or environmental issue during construction will be resolved onsite no later than 7 days through the EPC Contractor(s), Project Site Engineer while the ESMU and the PIU will be apprised of the action taken.

176. For grievance resolution of issues considered major such as compensation to crop damages, the following steps can be followed (see **Figure 8.1**):

- Affected persons (APs) will be informed verbally and in writing by the PIU (or designated representative) of the damages and entitlements for compensation. If the APs are satisfied, compensation can be claimed from the PIU or through the EPC Contractor(s). If the APs are not satisfied, they can request for clarification from the PIU. If the APs are not convinced with the outcome, they can file the grievance to the GRC with the help of the PIU who will provide the written documentation.

- The GRC will determine the merit of the grievance, conduct a hearing of the grievance in the presence of the APs and one AP witness, and will provide a decision within 15 days from the receipt of the complaint. Minutes of the meeting will be approved by the PMU and provided to the APs including the decision made by the GRC. The entire process should not exceed 30 days. If the APs are satisfied with the GRC decision, they can claim the compensation from the PMU and/or EPC Contractor(s).

- If the issue(s) remains unresolved, the case will be referred by the GRC to the appropriate Court of Law for settlement.

177. **Area of Jurisdiction:** GRC shall be set up at the *Panchayat* level where the subprojects will be implemented.

178. **Record-keeping:** PMU will keep a record of all the grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome. Documentation of the grievances filed and resolved will be summarized and included in the environmental monitoring reports submitted to ADB.

179. Disclosure of Information: Under the direction of the PMU, the PIU will inform the APs on grievance redress procedure, who to contact and when, where and how to file a grievance, time likely to be taken for redressal of minor and major grievances, etc. Grievances received and responses provided will be documented and provided to the APs during the process. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the field offices of APDCL and offices of the concerned local *Panchayat* and District Revenue Office (if required).

180. **Review of the Process:** The PMU will periodically review the implementation of the GRM and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

181. **Cost of Implementation:** Costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by APDCL.

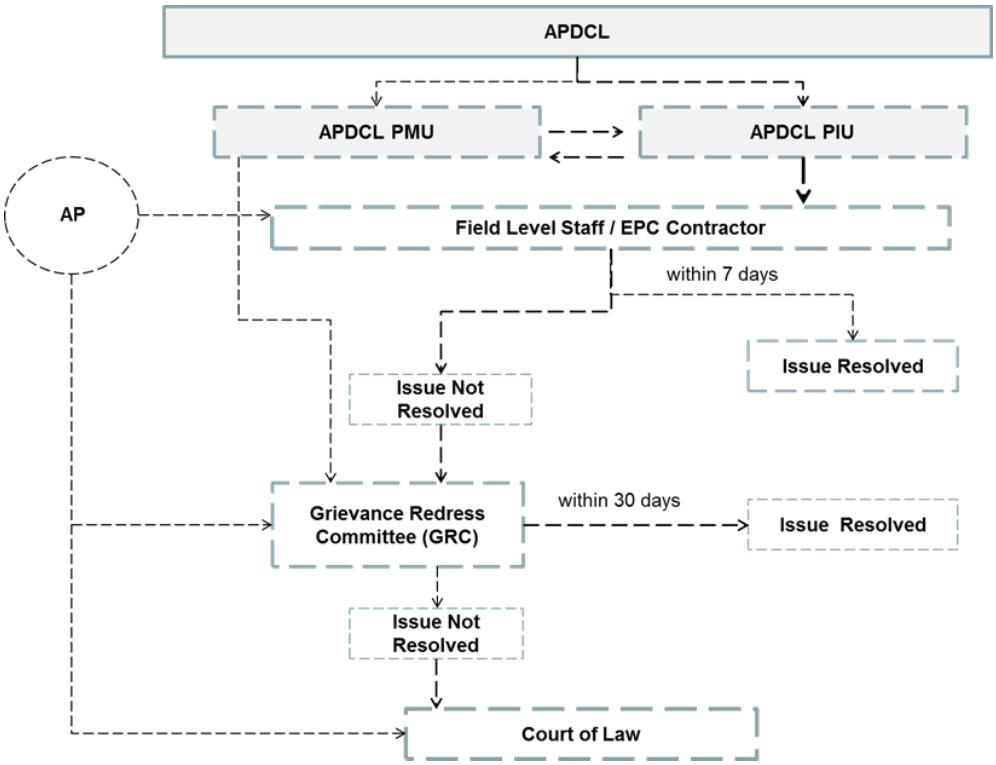


Figure 8.1 GRM Procedure

9. ENVIRONMENTAL MANAGEMENT PLAN

9.1 Mitigation Plan

182. The mitigation measures for identified environmental impacts are presented in **Table 9.1.** The environmental management plan (EMP) will be updated before the start of civil works, as needed, to cover any change in the condition of the site or alignment of distribution lines after the EPC contractor(s) check survey, and feedback from local people or other stakeholders (if any).

9.2 Monitoring Plan

183. The mitigation measures listed in the EMP require monitoring of environmental attributes both during construction and operation phase of the project by the APDCL. These requirements are listed in the EMoP.

184. During the construction stage, environmental monitoring will be on a daily or weekly basis to ensure that non-compliance to the EMP by the EPC Contractor(s) if any will be avoided and/or immediately addressed.

185. Monitoring and maintenance of the power distribution system during operation will ensure the integrity and safety of the structures and components, thus, minimizing safety risks to the public and damage to properties (see **Table 9.2** for EMoP).

9.3 Institutional Arrangements

186. The key institutions involved in the environmental management and monitoring process for subprojects are the PMU and PIU. **Figure 9.1** presents the institutional arrangement for safeguards implementation in Tranche 2.

9.3.1 Project Management

187. The PMU will be responsible for the overall project management and overseeing sub-project compliance with environmental and social safeguard requirements based on the EARF provisions while the PIU/Field offices will have primary responsibility for the environmental assessment and implementation of EMP and oversight of the EPC Contractor(s) or third party consultants in coordination with Environmental and Social Management Unit (ESMU). The EARF provisions include: (i) sub-project selection taking into account environmental screening criteria; (ii) sub-project environmental assessments prepared in accordance with the requirements set out in this EARF; (iii) appropriate public consultations and disclosures; (iv) effective management of the grievance redress mechanism; and (v) EARF compliance reported in the environmental monitoring report.

9.3.2 Reporting

188. Overall environmental reporting is handled by the Deputy General Manager (DGM) of PMU. The DGM will receive the Project's Quarterly Progress Report (QPR) from the project implementation team (ESMU and PIU), which will be further summarized for submission to ADB semi-annually during construction and annually during operation phase as environmental monitoring report.

9.3.3 Monitoring

189. Environmental monitoring will be handled by the Assistant General Manager (AGM) of the PMU. The AGM is in charge of the ESMU which has been set up by the APDCL.

9.3.4 Implementation

190. ESMU is responsible for the overall assessment and implementation of the EMP supported by the PIU. The ESMU functions as the i) oversight of field offices and EPC Contractor(s) for monitoring and implementing mitigation measures and the grievance redress mechanism; (ii) liaison with the field offices and EPC Contractor(s) to solve any environment-related issues during implementation; and (iii) prepares environmental monitoring reports every 6 months (for review and submission as required by the ADB).

191. To assist ESMU in their functions, APDCL may consider hiring an Environment and /or Social Consultant(s) at PIU level. Under the direction of ESMU and PIU, the hired consultant will also coordinate and interact with the PMU on compliance to ADB requirements, relevant government agencies and local authorities on clearances (as needed), update and finalize the draft IEE (as and when needed), and will prepare the environment section of the Project's Quarterly Progress Report (QPR) submitted to the PMU. The environment section from the QPRs will be summarized by the PMU who will be supported by the ESMU, and submitted as environmental monitoring reports to ADB semi-annually during construction and annually during operation phase. The environmental monitoring reports are publicly disclosed to the ADB website.

192. During operation, ESMU will be responsible in handling environmental issues and compliance to ADB's environmental requirements such as submission of the environmental monitoring report annually and in coordinating with complaints and/or grievances filed through the Grievance Redress Committee (if any).

9.3.5 EPC Contractor

193. ESMU and PIU will ensure that the EPC Contractor(s) will be informed of its responsibility to comply with the EMP and the requirements of ADB. There are specific responsibilities for EMP compliance during the construction phase. The EPC Contractor(s) work plan relevant to EMP implementation will be monitored by the ESMU and PIU, with the overall management and compliance supervised by the PMU. The EPC Contractor(s) will be required to submit to ESMU a monthly progress reports on the implementation of the EMP, which will form part of the QPR.

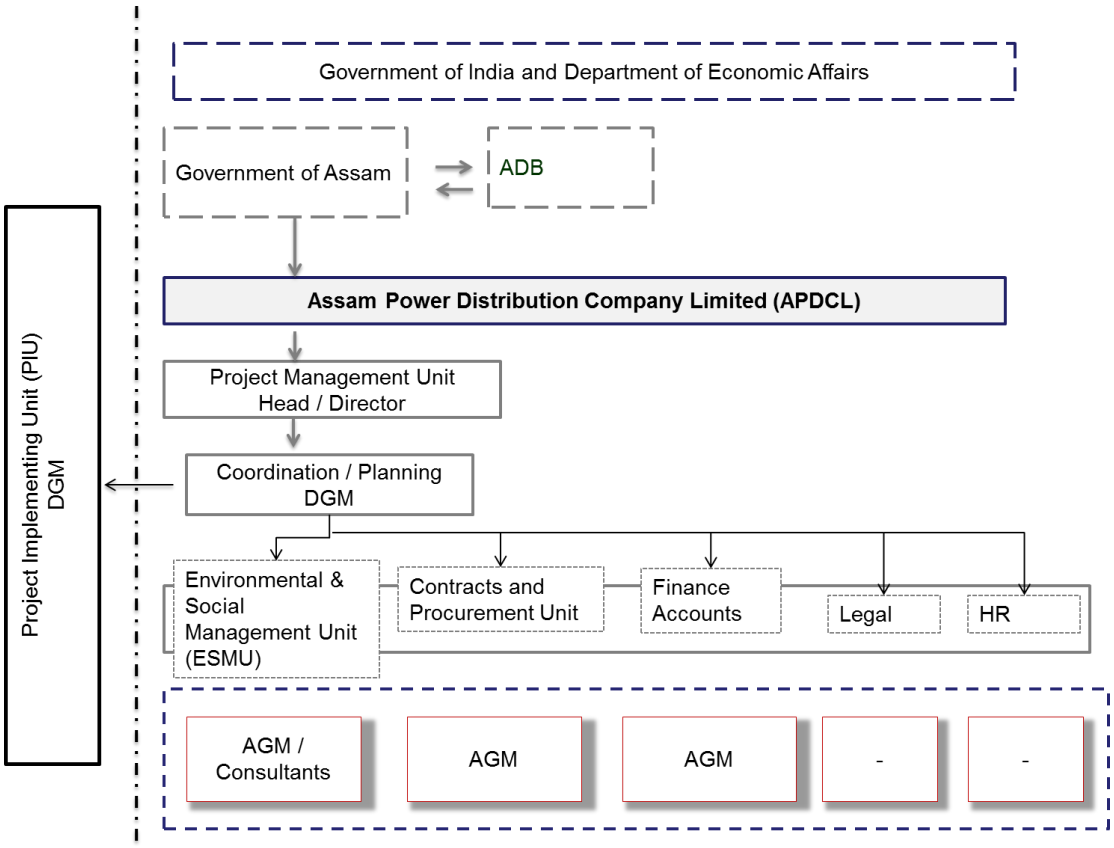


Figure 9.1 Institutional Arrangements for Implementation of Safeguards in Tranche 2

Table 9.1 Environmental Management Plan

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
Planning and Pre-Construction Stage					
Preparation of feasibility study and detailed project report					
1. New substation and new distribution lines for 33 kV and 11 kV					
• Location of substation and route selection of distribution lines	• Land and vegetation	• Fragmentation and/or loss of habitat • Tree cutting and vegetation clearing • Loss of agricultural land and crops	• Strict adherence to APDCL's criteria for site and route selection, EARF, and relevant section from the FFA • *All OH tension lines and associated structures to follow the design practice for typhoon risk as covered by best engineering practice* • Informal consultations to potentially-affected persons during preliminary site/route survey on type and scale of subprojects, and benefits from the entire project • Compliance to relevant provisions of Forest Conservation Act 1980, Guidelines for Declaration of Eco-sensitive zones around national parks and wildlife sanctuaries of MOEF, and Guidelines for linear	Included in the project cost	PMU, APDCL
	• Air and Noise	• Increase in dust and noise levels • Vibration			
	• Water	• Flooding • Sedimentation • Soil erosion • Degradation of existing water quality • Local drainage alteration			
	• People	• Displacement of housing, other structures, and economic activities • Concern/fear on the type and scale of the subprojects • Interference to existing utilities			

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			infrastructure intrusions in natural areas by the National Board of Wildlife (NBW) • Reference to relevant GoI standards and codes (e.g., IS 5613-1995 Part II, IS: 3072-1975, etc.) • Reference to relevant provisions in the World Bank Environment, Health and Safety Guidelines (EHS) 2007, and the International Finance Corporation (IFC) EHS Guidelines for Electric Power Transmission and Distribution (2007) • Inclusion of specific conditions to mitigate potential impacts in Tender Documents		
• Choice of equipment and technology	• Land and vegetation • Air and Noise • Water • People	• Release of chemicals and toxic gases • Noise generation and vibration	• Require suppliers or manufacturers that equipment specifications and/or guaranteed emissions comply with relevant standards of WB EHS Guidelines 2007 and CPCB/ PCB, Assam environmental standards • Include specific conditions of compliance in Tender Documents	Included in the project cost	PMU, APDCL
2. Rehabilitation and renovation of distribution systems					

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
• Replacement of oil-filled distribution transformer (DTR) with dry-type DTR	• Land and vegetation	• Residual oil spill during dismantling and transportation • Increase in waste/scrap material	• Strict adherence with plan for oil spill prevention and emergency response • Dismantled oil-filled DTRs to be transported in designated Central warehouses in Guwahati and Jorhat/Divisional stores under each Electrical Circles • Storage area will have impermeable flooring or bunded area of 110% volume • Dry-type DTR specifications that audible sound levels should be below ANSI/NEMA Standard ST-20 • Specific conditions to be included in Tender Documents	Included in the project cost	PMU, APDCL
	• Air and Noise	• No impact on air quality • Generation of noise from transformer			
	• Water	• No impact (location far from water bodies)			
	• People	• Lesser risk of fire hazard			
• Rehabilitation and modernization of existing 33 kV and 11 kV lines, and terminal bays	• Land and vegetation	• Trimming/destruction of vegetation in the ROW • Increase in waste/scrap material • Disturbance to wildlife at Hoollongapar Gibbon Wildlife Sanctuary (HGWS) - about 3 km of existing 33 kV line from Mariani to Nakarachi parallel to the entrance of the reserve	• *All OH tension lines and associated structures to follow the design practice for typhoon risk as covered by best engineering practice* • Strict compliance to relevant CPCB/ PCB, Assam environmental standards and WB EHS Guidelines 2007 • No intrusion to HGWS – strict compliance to the		PMU, APDCL
	• Air and Noise	• Vehicular emissions			
	• Water	• Disturbance to irrigation channels			
	• People	• Interruptions in power supply services			

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			relevant provisions of the Guidelines for linear infrastructure intrusions in natural areas by the NBW • Specific conditions of scrap/debris/waste management to be included in Tender Documents • Adequate buffer between rehab works and irrigation channels, wherever possible • Compensation for crop/vegetation damages (if any) • Communications strategy plan in engaging project stakeholders (e.g., inform the public of power service disturbances, hauling of replaced poles and lines, etc.)		
• Replacement of overhead high tension 33 kV and 11 kV lines with underground cables	• Land and vegetation	• Breaking of paved/asphalt roadside due to trenching activities • Loss of some vegetation/ornamental plants • Increase in waste/scrap material	• All civil works and structures to follow the national guidance on seismic design that calls for identification of maximum credible earthquake scenario and associated ground acceleration parameters. • Specify trenching activities be done in phased manner at 30 m-section intervals • Require re-pavement of opened area after cabling in	Included in the Project Costs	PMU, APDCL
	• People	• Disturbance to high density area, i.e., commercial properties/business due to trenching and fill operations • Inconvenience to people due to traffic in commercial areas affected			

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
		• Interference to existing utilities	timely manner • Provide scrap/debris/waste management plan • Require Contractor(s) to incorporate dust suppression measures and road work enclosures • Strict adherence to noise and vehicular emission standards set by CPCB/ PCB, Assam and WB EHS 2007 whichever applicable.		
	• Water	• Damage to water supply pipelines that may affect water quality			
	• Air and Noise	• Increase dust and noise levels, and vibration due to trenching			
Construction Stage					
Prepare construction management work plan	• People • Land • Air and Noise • Water • Waste	• Avoid effects of EPC Contractor(s) unplanned activities • Smooth work implementation	• A construction schedule (e.g., civil works on substation and trenching activities, erection of poles, R&M activities, hours of construction, etc.) • Traffic management plan • Community/pedestrian safety plan • Workers' safety plan • Spoils disposal plan • Noise and dust control plan • Accidental drainage spill management plan • Stormwater management plan • Materials management plan • Construction waste management plan addressing both liquid and	Included in the costs of EPC Contractor(s)	EPC Contractor(s), PMU, APDCL, PIU, ESMU

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			solid waste		
Hiring of project staff and workers	• People	• Social conflict due to potential workers' migration • Dispute over transparency of hiring	• EPC Contractor(s) will be required to use local labor for manual work and eligible local workforce for clerical and office jobs	---	EPC Contractor(s), PMU, APDCL, PIU, ESMU
Orientation for contractor and workers	• People	• Awareness of workers on the environmental requirements and their responsibility • Familiarity of wildlife-associated issues to minimize conflict • Awareness of EPC Contractor(s) of their responsibility in implementing the EMP	• Conduct briefing on EMP, records management, monitoring, and reporting • Identify critical areas to be monitored and the required mitigation measures • Create awareness of sexually-transmitted diseases such as HIV/AIDs • Create awareness of potential man-wildlife conflict along the existing 33 kV line from Mariani-Nakarachi (about 3 km runs parallel to the entrance of HGWS; existing line and entrance to	Included in the costs of EPC Contractor(s)	EPC Contractor(s), PMU, APDCL, PIU, ESMU Staff of NBW and/or representative from Village Protection Committee of Mariani, Dihingia Para Grant, and/or Chintali Gaon as resource persons on man-wildlife

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			sanctuary separated by Dhodar Ali Road)		concerns
Site preparation, land and vegetation clearing • Kharghuli Substation • Poles/towers for 33 kV and 11 kV Distribution lines • Laying and alignment of UG cabling	• Land and vegetation	• Clearing of vegetation along the ROW and substation site • Disturbance/alteration of habitat along the ROW and destruction of habitat in substation • Breaking of paved/asphalt roadside due to trenching required for UG cabling • Soil erosion and surface runoff • Increase in waste generation	• Landscaping/replanting of trees of native species will be done at the Kharghuli substation site after completion of construction works • No trees clearing in Kharghuli site; minimal vegetation clearing along the ROW • EPC contractor will provide a diagram of the site to ensure compliance to the provisions of the EMP. The diagram will specify where the stockpiles are stored and handled, and spoils disposed. It will lay out boundaries, especially in terms of the site / facility's proximity and/or distance from the Brahmaputra river. • Controlled backfilling at the Kharghuli substation and erosion-control measures (e.g., preserve topsoil and reinstate after construction completed) will be installed • Debris from trenching will be hauled to designated dumping area and/or landfill sites • Excavated soil for the poles/towers and UG cabling	Included in the costs of EPC Contractor(s)	EPC Contractor(s), PMU, APDCL, PIU, ESMU

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			will be reused		
	• Water	• Localized flooding at Kharghuli substation, river crossing for new 33 kV line Barnagar GSS to Howly line (20 km); River Beki crossing by B+6 tension type tower • Oil spillage due to construction equipment	• Earth-moving works/excavation will be scheduled during the dry season • Install erosion-control measures such as silt traps, as needed • Spoils from Kharghuli substation will be stored away from the edge of Brahmaputra River • The EPC Contractor(s) will strictly adhere to the plan for oil spill prevention and emergency response of APDCL		
	• Air and Noise	• Increase in vehicular emissions • Increase in dust and noise levels	• Provide temporary enclosures to areas generating noise and dust • Monitor smoke-belching vehicles • Require vehicles to observe low-speed to minimize noise, no blowing of horns		
	• People	• Inconvenience in commercial areas in Guwahati affected by trenching • Disturbance to usual traffic flow • Loss of crops and disturbance to agricultural activities	• Compensation for temporary damages to crops/plants along the ROW • Schedule site preparation activities along ROW to avoid farming and		

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			harvesting seasons, whenever possible • Inform the public of work schedule of site preparation		
Construction and civil works at Kharghuli substation, erection of and stringing of conductors of new 33 kV and 11 kV lines, replacement of overhead 11 kV with UG cabling, and re-conductoring of existing 33 kV and 11 kV lines	• Land and vegetation	• Loss of habitat/vegetation clearing for new 33 kV and 11 kV lines • Temporary disturbance/trimming of vegetation in the ROW of existing 33 kV and 11 kV lines • Increase in waste/scrap material • Breaking of paved/asphalt roadside due to trenching • Disturbance to wildlife at HGWS - about 3 km of existing 33 kV line from Mariani to Nakarachi parallel to the entrance of the reserve	• Compensation for temporary damages to crops/plants along the ROW • Schedule construction works along ROW (new 33 kV and 11 kV lines) to avoid farming and harvesting seasons, whenever possible • No tree cutting in Kharghuli substation and only lopping of trees along ROW of distribution lines to keep the 3m clearance • Road repair/re-pavement after completion of trenching activities • Construction debris/waste will be disposed in designated dumpsites and/or landfill • Provide garbage bins at strategic locations • Rehabilitation / reconductoring works and schedule of 33 kV line parallel to HGWS will be coordinated with the Deputy Forest Officer and the Village Protection Committee of Mariani,	Included in the costs of EPC Contractor(s)	APDCL, PMU, PIU, ESMU

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			Dihingia Para Grant, and Chintali Gaon • Designate staff to monitor traffic along Dhodar Ali Road parallel to HGWS and to restrict access of workers to HGWS during rehabilitation works along the 33 kV Mariani-Nakachari distribution line		
	• Air and Noise	• Increase in dust from earth-moving works • Increase in vehicular emissions from construction vehicles and transport of materials • Increase in noise levels from construction vehicles, equipment and trencher	• Select low-noise portable trencher for trenching • Observe low speed by construction vehicles to reduce noise and no blowing of horns • Implement traffic management plan • Require EPC Contractor(s) to maintain and tune up construction vehicles and heavy equipment regularly to reduce emissions • Provide construction vehicles with tire-washing area to reduce dust • Transport of dust-generating materials will be covered • Provide temporary enclosures to dust and noise-generating construction works • Open land area in Kharghuli substation and along the 33		

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			kV and 11 kV lines will be sprayed with water, as needed • Provide warehouse of materials onsite at Kharghuli substation to reduce trips of material delivery		
	• Water	• Generation of sewage at Kharghuli site • Localized flooding at Kharghuli, along the ROW of new 33 kV and 11 kV lines, and trenching • Increase in turbidity in Brahmaputra River, Beki River, and other perennial surface waters along the 33 kV and 11 kV lines	• Significant ground disturbance will be done during the dry season • Provide sanitary facilities and safe drinking water to workers • Enforce good housekeeping at all times in construction sites • Implement drainage and stormwater management • Adequate buffer between the surface water bodies and earth-moving works will be imposed • Substation transformer installed on an impermeable floor.		
	• People	• Exposure to health and safety risks to workers and the public • Interference to existing roads (e.g., Dhodar Ali) and railway crossings • Disturbance to high density area (mainly commercial businesses)	• Use of proper safety clothes/equipment for workers • Provide first aid kits and fire extinguishers at all sites with construction works (i.e., Kharghuli, along new 33 kV		

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
		in Guwahati City due to trenching • Inconvenience due to traffic	and 11 kV lines, and UG cabling) • Provide appropriate grounding and ensure deactivation of live power lines for existing 33 kV and 11 kV reconductoring • Conduct health and fitness for workers once every two months • Inform the public of construction work schedules in a timely manner • Construction management work plan to be strictly implemented • Scaffoldings will be placed over road points • Danger and clearly visible warning signs will be posted at designated sites • Designate staff to direct pedestrians crossing and flow of construction vehicles • Pedestrian road crossings will be provided • Perform exercises among workers every day before start of work • Strictly impose construction vehicles to follow road traffic regulations		

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
Replacement of oil-filled DTR with dry type DTR	• Land and vegetation	• Oil spill during dismantling and transportation • Increase in scrap/waste material	• Inform affected areas timely of power outages schedule, if any • Dismantling process will follow manufacturers' specifications • Strict adherence with the plan for oil spill prevention and emergency response • Dismantled DTR to be transported and stored in designated Central warehouses in Guwahati and Jorhat/Divisional Stores under each Electrical Circle • Storage area of dismantled DTRs will have impermeable floor on a bunded area of 110% volume	Included in the costs of EPC Contractor(s)	APDCL, PMU, PIU, ESMU
	• Water	• Oil spill during transportation			
	• People	• Interruptions to power supply services			
Operation and Maintenance Stage					
Use of mineral oil for transformers	• Land • Water	• Accidental spillage that would contaminate land and water	• Substation transformer installed in a bunded area of 110% volume • Fuel and lubricants stored in drums or tanks will be placed on impermeable surface	Included in the O & M costs of Project	APDCL, PMU, PIU, ESMU
	• People	• Occupational health risks to workers due to exposure • Fire hazards	• Acceptance of mineral oil should be accompanied with Material Data Safety Sheets and/or be certified that it is PCB-free • Fire extinguishers readily available in storage areas for		

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			mineral oil		
Maintenance of substation and distribution lines	• People	• Hazards such as electrocution, lightning strike, etc. due to accidental failure of distribution lines	• Signage meeting the IEEE standards will be placed on all overhead lines warning of electrical hazards • Provide security and inspection personnel to avoid pilferage and vandalism of equipment and lines • Appropriate grounding and deactivation of live power lines during maintenance work • Substations designed with protection system that shuts off during power overload or similar emergencies • Maintain and comply with electrical standards • 33 kV and 11 kV distribution lines entering and leaving the Kharghuli substation, and 11 kV UG cables are insulated (or covered) to minimize hazards • Conduct information briefing to affected stakeholders/dwellings within and around the project activity area to enhance awareness on safety practices of living near the Kharghuli	Included in the O & M costs of Project	APDCL, PMU, PIU, ESMU

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			substation and the 33 kV and 11 kV distribution lines at the time of pre-commissioning.		
		• Safety-related risks	• Kharghuli substation will be provided with modern fire control systems/firewall • Property boundary of the Kharghuli substation will be fenced for safety and will be provided with security personnel to regulate entry and exit • Kharghuli substation will be designed to comply with fire prevention and control codes • Route setback of 33 kV and 11 kV overhead distribution lines from dwellings will be in accordance with permitted level of power frequency	Included in the O & M costs of Project	APDCL, PMU, PIU, ESMU APDCL, PMU, PIU, ESMU
		• Accident working in elevated heights	• Provide safety belts and personal protection gears/equipment • Conduct orientation/training on safety • Prepare and implement workers' safety plan consistent with Indian Factories Act 1948 and WB EHS Guideline 2007		
		• Potential exposure to electric and magnetic fields (EMF)	• EMF levels expected to be way below the limits set by International Commission on	Included in the O & M costs of	

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			Non-Ionizing Radiation Protection(ICNRP) which is 4.17 kV/m for electric field and 833 mG for magnetic field • Sub-stations will be fenced and security staff assigned to prevent unauthorized public access • Conduct information briefing to affected stakeholders/dwellings within and around the project activity area to enhance awareness on safety practices	Project	
	• Land and vegetation	• Danger to wildlife that may cross south of Dhodar Ali Road from HGWS along the 33 kV Mariani-Nakarachi line from (about 3 km parallel to entrance of HGWS)	• Periodic maintenance of maximum sag condition (ground vertical clearance) to ensure compliance to Guidelines of NBW • Maintenance of spikes from 1.21 m-2.1 m at the poles to ward off animals • Coordinate with assigned Deputy Forest Officer, NBW and the Village Protection Committee at Mariani, Dihingia Para Grant, and Chintali Gaon on efforts/programs to deter wildlife crossings	Included in the O & M costs of Project	APDCL, PMU, PIU, ESMU
	• Air	• Fugitive emissions of SF_6	• Fugitive emissions will be monitored following protocols	Included in the O & M costs of	APDCL, PMU, PIU,

Project Activity	Environmental Component Likely to be Affected	Description of Potential Environmental Impact	Mitigation/Enhancement Measures	Estimated Cost	Responsible Unit
			consistent with IEEE and IEC • Conduct annual inventory of supply and usage • Conduct measurement using hand held devices • EPC contractor will follow guidelines for proper handling of SF6 at the substation site to avoid any untoward incidents.	Project	ESMU
	• Noise	• Disturbance to settlements near the Kharghuli substation	• Periodic maintenance of equipment such as transformers and capacitors to minimize noise generation • Provide enclosure of noise-generating equipment • Monitor ambient noise levels to meet noise regulations standards	Included in the O & M costs of Project	APDCL, PMU, PIU, ESMU

Table 9.2: Environmental Monitoring Plan

Project Stage	Parameter / Indicator	Location	Method of Measurement	Frequency	Responsible Unit
Pre-Construction and Planning	Noise level of equipment and machineries	Substation site UG cabling / Trenching Site where DTR will be dismantled and replaced	Machinery and equipment specifications Compliance to ambient noise levels	Once	APDCL PMU, PIU, ESMU
	Soil quality	Substation site B+ Tension towers at River Beki crossing	Ocular inspection	Once	APDCL PMU, PIU, ESMU
	Loss of terrestrial habitat; Tree felling; Clearing of vegetation	Substation site Erection of poles; Stringing of Conductors: ROW of new 33 kV and 11 kV lines) ROW of existing 33kV, 11kV and LT lines for proposed R&M)	Ocular inspection, transect survey	Once	APDCL PMU, PIU, ESMU
	Water quality	Substation site	Water quality testing for pollution	Once before construction, once during constructionand once after completion of construction	APDCL PMU, PIU, ESMU
	Proximity to water resources	Substation site (boundary to be at a distance of 10 m) Location of proposed B+ Tension towers footing (river Beki crossing); no footing in water Erection of	Ocular inspection Maps	Once	APDCL PMU, PIU, ESMU

Project Stage	Parameter / Indicator	Location	Method of Measurement	Frequency	Responsible Unit
		poles: (ROW of new 33 kV and 11 kV lines)			
	Wildlife crossing	Along ROW of existing 33 kV lines at Nakachari to Mariani near Hoollongapar Gibbon Sanctuary	Ocular survey/ observation, Secondary data	Quarterly to capture seasonal variations	APDCL PMU, PIU, ESMU
	Loss of agricultural land/crops, tea plantations	ROW of new 33 kV and 11 kV lines ROW of existing 33kV, 11kV and LT lines for R&M	Ocular inspection, transect survey	Once	APDCL PMU, PIU, ESMU
	Setback distances to nearest dwellings / commercial businesses / drainage lines	Substation site ROW of new 33 kV and 11 kV lines Laying of UG cabling	Ocular inspection, transect survey	Once	APDCL PMU, PIU, ESMU
Construction	Hiring / Local recruitment of workers and staff	Substation site Erection of poles; Stringing of conductors DTR dismantling and replacement	Log of Number of local workers and staff recruited	Monthly	EPC Contractor(s), APDCL PMU, PIU, ESMU
	Orientation of Contractor(s) and hired workers on issues like HIV/AIDS	Substation site Erection of poles; Stringing of conductors DTR dismantling and replacement	Log of Number of participants	Once before construction, and as needed	EPC Contractor(s), APDCL PMU, PIU, ESMU

Project Stage	Parameter / Indicator	Location	Method of Measurement	Frequency	Responsible Unit
	Orientation of Contractor(s) and hired workers on Compliance to Environmental Management Plan (EMP) etc.	Substation site Erection of poles; Stringing of conductors (new and existing power lines) DTR dismantling and replacement	Log of Number of participants	Once before construction and once during construction, as needed	EPC Contractor(s), APDCL PMU, PIU, ESMU
	Sprinkling/spraying water on open land areas, and before movement of construction vehicles for dust suppression	Substation site Trenching activities for laying of UG cabling Road easements affected by delivery of equipment and construction material Erection of poles; Stringing of conductors (new and existing power lines)	Ocular inspection / spot checks	Once a day at Substation site during dry season Weekly at road easements (or as needed) Once a day during trenching for laying of UG cabling	EPC Contractor(s), APDCL PMU, PIU, ESMU
	Solid / Liquid waste management	Sub-station site workers' camps Erection of poles; Stringing of conductors (new and existing power lines) Trenching site for laying of UG cabling	Ocular inspection/spot checks	Every week	EPC Contractor(s), APDCL PMU, PIU, ESMU
	Danger and warning signs for safety of workers and the public	Sub-station site Road easements	Ocular inspection/spot checks	Once a month for Substation site and Road easements	PMU and ESMU, APDCL, EPC

Project Stage	Parameter / Indicator	Location	Method of Measurement	Frequency	Responsible Unit
		affected by delivery of equipment and construction material Trenching site for laying of UG cabling Erection of poles; Stringing of conductors DTR dismantling and replacement		affected by delivery of equipment and construction material Bi-weekly for trenching site for laying of UG cabling Once at the time of dismantling of DTR	Contractor
	Announcement to the public of proposed works schedule	Substation site Trenching site for laying UG cabling Along the road easement affected by interconnections of distribution lines Erection of poles; Stringing of conductors	Work schedule log sheet	As needed One month prior to commencement of trenching operations 24 hours prior for any scheduled power outage	PMU and ESMU, APDCL, EPC Contractor
	Oil spill control	Substation site Site of DTR dismantling and replacement	Ocular inspection	Once a month for Substation site and once at the time of DTR dismantling	PMU and ESMU, APDCL, EPC Contractor
	Erosion control measures such as silt traps	Substation site Erection of poles	Ocular inspection	Once a month	PMU and ESMU, APDCL, EPC Contractor
	Flood prevention measures	Substation site Location of B+ Tension tower at River Beki crossing	Ocular inspection	Once	PMU and ESMU, APDCL, EPC Contractor
	Smoke belching	Substation site	Ocular	Weekly	PMU and

Project Stage	Parameter / Indicator	Location	Method of Measurement	Frequency	Responsible Unit
	construction vehicles	Erection of poles; Stringing of conductors (new and existing power lines) Site where DTR will be dismantled and replaced	inspection / spot checking	Once at the time of DTR dismantling	ESMU, APDCL, EPC Contractor
	Noise and dust level	Substation site; periodic maintenance of equipment such as transformers and capacitors to minimize noise generation Along the road easement affected by inter-connection of distribution lines Erection of poles; Stringing of conductors (new and existing power lines) Trenching site for laying of UG cabling	Measurement of noise level at the substation site during construction and after commissionin g of substation Ocular inspection/sp ot checks	Quarterly Once a week for trenching and twice a month for the rest	PMU and ESMU, APDCL, EPC Contractor
OPERATION	Failure of distribution lines (including UG cabling) Substation transformer	Along the ROW/ alignment Substation site Site where DTR is replaced	Maintenance log sheet	Monthly	PMU and ESMU, APDCL

Project Stage	Parameter / Indicator	Location	Method of Measurement	Frequency	Responsible Unit
	Noise	Substation	Noise meter	Quarterly	APDCL PMU, PIU, ESMU
	SF_6 fugitive emissions	33 kV bay with terminal equipment utilizing SF_6 circuit breaker Substation site	Inventory of in/out Measurement by hand held devices	Yearly / Quarterly	APDCL PMU, PIU, ESMU
	Occupational health, and safety	Substation site Along the alignment of power lines	Number of accidents and/or injuries	Semi-annually	PMU and ESMU, APDCL
	Road re-pavement	Trenching site for laying UG cabling	Ocular inspection	Monthly	PMU and ESMU, APDCL
	Tree planting, maintenance of green landscape	Substation site	Ocular inspection	Quarterly	PMU and ESMU, APDCL
	Housekeeping	Substation site	Spot checks	Monthly	PMU and ESMU, APDCL
	Collection of waste (i.e., oil, garbage, etc.)	Substation site	O & M log sheet	Monthly	PMU and ESMU, APDCL
		Along ROW of new 33 kV and 11 kV lines Along ROW of existing 33kV, 11kV and LT lines for R&M	Spot checks/ observation	Monthly	PMU and ESMU, APDCL
	Pilferage of cables	Along ROW of new 33 kV and 11 kV lines Along ROW of existing 33kV, 11kV and LT lines for R&M	Ocular inspection O&M log sheet (security operations)	Quarterly	PMU and ESMU, APDCL

10. CONCLUSION AND RECOMMENDATION

194. In accordance with the ADB's Safeguard Policy Statement 2009, this Tranche 2 project is categorized as "Category B" requiring an IEE. The MOEF, in September 2006, has exempted transmission projects from environmental clearances as they are perceived as a non-polluting intervention. However, if the alignment will traverse areas designated as forests by the GoI, transmission projects will be subject to the relevant provisions for clearances in the Forest Conservation Act 1980 (amended in 2004).

195. Distribution projects require land for substations and minimal land for the footings of towers/poles. The ROW for the 33 kV and 11 kV distribution line is 15 m and 7 m, respectively. Vegetation along the ROW will be cleared for safety reasons and proper operation and maintenance of the distribution lines. One of the primary considerations in selecting the site and route alignment is avoidance of forests, land acquisition, and potential adverse environmental impacts.

196. There will be no land acquisition required for the Kharghuli substation. None of the route alignments of the new 33 kV and 11 kV lines and the existing 33 kV, 11 kV, and LT lines requiring R&M pass through or are located within or near any environmentally-sensitive areas, and any area declared as protected by GoI such as the five national parks, 18 wildlife sanctuaries, and cultural or archeological excavation sites of national importance.

197. The proposed route alignment for new 33 kV (137.5 ckt-km) and 11 kV (7 ckt-km) will generally follow road easements but will pass through agricultural land, tea plantations, and along settlements in some areas. There is no re-routing of existing 33 kV lines (956 ckt-km), 11 kV lines (1,000 ckt-km) and Low Voltage lines (1,555 ckt-km) selected for R&M activities, and will not incur major disturbances during the installation of poles and stringing of conductors.

198. The R&M reconductoring of the existing 33 kV line from Mariani to Nakachari (about 3 km out of the total 15 km) runs parallel to the entrance of the Hoolongapar Gibbon Wildlife Sanctuary (HGWS). The R&M activities in this area will be done south of the HGWS entrance and there is an existing state-level road (Dhodar Ali) that separates them by about 1 km. In this area, vertical ground clearance of about 10 m will be maintained at the maximum sag condition. Suitable spikes on poles at the height of 1.21 m and 2.1 m will be installed to ward off animals that may come close to the distribution poles and damaging them by rubbing their bodies against them, particularly elephants.

199. The R&M of existing substations will involve additional 6 units of 33 kV bays with terminal equipment, replacement of 204 oil-filled distribution transformers with dry-type transformers, and replacement of overhead 11 kV lines and LT lines with underground *UG) cabling. These R&M activities will be conducted in a phased-manner so as not to cause interference with existing utilities (power outage) while the dismantling and transport of transformers will follow best industry practice as well as national and international standards.

200. The subproject activities such as setting up an independent meter testing laboratory, area load dispatch centers, and IT module for centralized uniform revenue billing system will not have any construction related activities or corresponding environmental impacts.

201. The PMU will set up a grievance redress mechanism (GRM) as soon as the project commences to deal with environmental issues that may be raised by stakeholders during implementation. The PMU will ensure the representation of women in the Grievance Redress Committee (GRC) which will function from construction to operation .phase.

202. Consultations of local people were done in September 2014 as part of the preliminary surveys and in conducting the environmental assessment. Concerns raised during consultation were common and they include load shedding or prolonged power outage, voltage drop, fluctuations, and the lack of reliable and stable supply of power affecting their businesses, crop production, livelihood and general day to day affairs. Concerned local people were aware of the proposed project and were supportive due to expected benefits such as availability of reliable power supply as well as employment

203. Subprojects in Tranche 2 are not expected to cause significant adverse environmental impacts during the construction and operation phase. Construction impacts can be easily mitigated by proper planning and best engineering practices. Relevant construction standards issued by GoI for the design, installation and maintenance of substations and distribution lines such as IS: 5613 (1995) Part II, IS: 4091-1967 and IS: 3072 (1975) will be complied. Mitigation measures to minimize identified environmental impacts have been incorporated in the environmental management plan and monitoring plan.

APPENDIX 1: PROJECT OUPTUTS

1.1 OUTPUT 1: EXPANSION AND UP-GRADATION OF THE DISTRIBUTION SYSTEM

1.1.1 UPPER ASSAM REGION (UAR)

PROPOSED 33 kV AND 11 kV LINES						
S. No.	**Name of Electrical Circle**	**District**	**[53]Length of proposed 33 kV line (km)**	**Length of proposed 11 kV line (km)**	**Benefit Area: No. of Villages/ Tea Estates**	**Railway Track Crossing with New 33 kV lines (km)[54]**
1	Sivasagar	Sivasagar and partly covering Dibrugarh	44 km	-	Kawoimari NC Duliabam Nachani No.1 Khatikhedi Chenimari Gaon Da Dhara Grant Dehajan Habi Konwar Raichai Sepon Khara Haat T.E	Railway crossings at Kwowang and Behaiting for Kwowang to Behaiting line (span = 0.15 km); and Railway crossings at Demow and at Moran for Demow to Moran line (span = 0.15 km)
		TOTAL	44 km			No of RAILWAY CROSSING = 2 (0.3 km)
NEW 33 kV BAY WITH TERMINAL EQUIPMENT						
S. No.	Name of Electrical Circle	New with proposed 33 kV line[55]		Quantity (Number of New Bays with Terminal Equipment)		

[53] New 33kV lines for system strengthening and reliability; Standard 33 kV S/C Line; Pole = GI Steel Tubular with GI Channel, Cross Arm, Bracing Angle; Conductor: ACSR Wolf, Span 40 meters

[54] Railway track crossing of 33 kV S/C Line; Pole = Pole = GI Steel Tubular with GI Channel, Cross Arm, Bracing Angle; Conductor: 33 kV Single core 630 sq.mm XLPE cable, Span 150 meters

[55] Equipment = 33 kV VCB/SF_6 (quantity 1); 33 kV Isolators with Earth Blade (quantity 1), 33 kV Isolators without Earth Blade (quantity 1), 33 kV single phase multi-core CT (quantity 3), 33 kV lightening arrestors (quantity 3), 33 kV feeder panel (quantity 1), switch yard steel structure, grounding equipment, connectors, insulators, LT power and Control cables, 100 x 50 mm channel

1	Sivasagar	✓	4
		TOTAL	4

1.1.2 CENTRAL ASSAM REGION (CAR)

NO PROPOSED LINES FOR CAR

1.1.3 LOWER ASSAM REGION (LAR)

PROPOSED SUB-STATION COMPONENT 1 / LAR									
S. No.	**Name of Electrical Circle**	**District**	**Location**	**Capacity (MVA)**	**Quantity**	**Area (ha)**	**Ownership**	**Benefit**	**Remarks**
1	Guwahati -I	Kamrup Metro	Kharghuli	10	1	0.13 ha	Guwahati Metropolitan Departmental Authority (GMDA)	Meet the growth demand and the local energy requirement	The APDCL has obtained a Letter of Allotment issued by the GMDA on 1/2/2013 (allocated plot no. 523), and “Request to Proceed” letter from PMU of JICA on 29 October 2014. Documenarty evidence attached at the end of Appendix 1 The construction of S/S will require about of 0.13 ha land. The total site is approximately 4.3 ha
				TOTAL SUBSTATION	**1**				

ADDITIONAL 33 kV AND 11 kV LINES FOR NEW SUBSTATION						
S. No.	**Name of Electrical Circle**	**District**	**Length of proposed 33kV line (km)**	**Length of proposed 11 kV line (km)**	**Benefit Area: No. of Villages / Tea Estates**	**Remarks**
1	Guwahati – I	Kamrup Metro	4 km	6 km	Guwahati City Kharghuli, Ganesh Nagar, Gopal Nagar	
	TOTAL		**4 km**	**6 km**		

PROPOSED 33 kV AND 11 kV LINES						
S. No.	**Name of Electrical Circle**	**District**	**[56]Length of proposed 33kV line (km)**	**[57]Length of proposed 11 kV line (km)**	**Benefit Area: No. of Villages/ Tea Estates**	**Railway Track Crossing[58] / River Crossing[59] with New 33 kV lines (km)**
1	Guwahati – I	Kamrup Metro	8 km	-	Guwahati City(Part) Machkhowa Fancy Bazar	One railway crossing for replacement of OH 33 kV line at Paltan Bazar Railway Station t with UG railway crossing (span 0.25 km)
2	Barpeta	Barpeta	20 km	-	Howly Howly gaon Kaljhar Ghilajhari Ohulkipara Kathlijhar Khatalpara Garemari gaon Itarbheta	One river crossing at river Beki, Barnagar GSS to Howly line (span = 0.35 km)
		Nalbari	30 km		Makhibaha Tihu Baniyakuchi Bhaluki road	One railway crossing Sariahtoli to Nathkuchi line (span = 0.15 km)
		Barpeta	18 km		Sarupeta Bhabanipur Kalbari Kordoi Guri Kurobaha Gaon	-

[56] New 33kV lines for system strengthening and reliability; Standard 33 kV S/C Line with Pole = GI Steel Tubular with GI Channel, Cross Arm, Bracing Angle; Conductor: ACSR Wolf, Span 40 meters

[57] New 11 kV line for segregation of rural feeder; Pole = Pre-Stressed Concrete (PSC), Conductor ASCR Raccoon

[58] Railway track crossing of 33 kV S/C Line; Pole = Pole = GI Steel Tubular with GI Channel, Cross Arm, Bracing Angle; Conductor: 33 kV Single core 630 sq.mm XLPE cable; Span 150 meters

[59] River crossing for 33 kV D/C Line with B+6 Tension Tower (Single Span), Conductor ASCR Wolf; Span 350 meters

PROPOSED 33 kV AND 11 kV LINES						
S. No.	**Name of Electrical Circle**	**District**	**[56]Length of proposed 33kV line (km)**	**[57]Length of proposed 11 kV line (km)**	**Benefit Area: No. of Villages/ Tea Estates**	**Railway Track Crossing[58] / River Crossing[59] with New 33 kV lines (km)**
		Nalbari and Partly Bagcha	7.5 km		Barama Kadamtal Nikasi Road Akhara Bangnabari	
3	Guwahati –II	Kamrup Metro	10 km	7 km	33 kV line to benefit Maligaon Rly Colony NER Rly HQ Dolibari Gauripur Singimari Industrial park 11 kV lines to benefit Town of Sualkuchi Town of Boko	One railway crossing at Maligaon for Kamakhaya to Maligaon line (span 0.15 km) One 33 kV S/S bridge link at Sarighat with cross link poly-vinyl (XLPE) cable for Jalukbhari to Amingaon line (Span cable length = 2.5 km)
		TOTAL	93.5 km	7 km		No OF RAILWAY CROSSING = 3 (0.55 km), RIVER CROSSING = 1 (0.35 km) ,1 BRIDGE LINK = (2.5 km)

33 kV BAY WITH TERMINAL EQUIPMENT				
S, No	Name of Electrical Circle	New with proposed 33 kV line[60]	Description	Quantity
1	Barpeta	✓	At Barnagar GSS for 33 kV line from Barnagar GSS to Howly S/S	1
		✓	At Sariahtoli GSS & at Nathkuchi S/S for 33 kV line from Sariahtoli GSS to Nathkuchi S/S	2
		✓	At Pathsala 33/11 kV S/S & at Sarupeta 33/11kV S/S for 33 kV line from At Pathsala S/S to Sarupeta S/S	2
		✓	At Barjhar S/S (Barama) for 33kV line from Barjhar S/S to Katahbari S/S	1
2	Guwahati -II	✓	Maligaon Railway S/S for 33 kV line from Kamakhaya GSS to Maligaon Railway 33/11kV S/S	1
3	Guwahati -I	✓	Terminal equipment at Kharghuli S/S	1
			TOTAL	**8**

[60]Equipment = 33 kV VCB/SF_6 (quantity 1); 33 kV Isolators with Earth Blade (quantity 1), 33 kV Isolators without Earth Blade (quantity 1), 33 kV single phase multi-core CT (quantity 3), 33 kV lightening arrestors (quantity 3), 33 kV feeder panel (quantity 1), switch yard steel structure, grounding equipment, connectors, insulators, LT power and Control cables, 100 x 50 mm channel

1.1.4 UPPER ASSAM REGION (UAR)

PROPOSED R&M ACTIVITY AND DTR REPLACEMEENT								
S. No.	Name of Electrical Circle	District	[61]R / M – 33 kV (km)	[62]R/M - 11 kV (km)	[63]R/M – LT (Km)	[64]DTR Replace (No).	Divisional Store	Remarks
1	Sibsagar	Sivasagar and partly covering Dibrugarh	85 km	60 km	50 km	4	Sivasagar, Nazira and Moran	Dismantled equipment associated with R&M activities and DTR replacement will be taken to the Central warehouse or Divisional Stores
2	Jorhat	Jorhat	75 km	100 km	150 km	20	Jorhat-I and II, Teok	See comment above, Jorhat is a Central warehouse.
3	Tinsukia	Tinsukia	1 km	60 km	100 km	20	Tinsukia and Digboi	See above
4	Dibrugarh	Dibrugarh	70 km	60 km	100 km	10	Dibrugarh	See comment above
5	Golaghat	Golaghat	22 km	60 km	75 km	10	Golaghat	See comment above
	TOTAL		**253 km**	**340 km**	**475 km**	**64**		

[61]R&M & Re-conductoring / refurbishment of 33 kV line includes (conversion of Single circuit line to Double circuit, on need basis) and/or replacement of degraded PSC /STP poleswith new PSC/ STP poles and AAAC Raccoon conductor by ACSR Wolf conductor and heightening of the line; Pole = PSC with GI channel, cross arm, bracing angle or STP (SP-76) with GI channel, cross arm, bracing angle

[62]R&M & Re-conductoring / refurbishment of 11 kV line from Weasel / Rabbit / old ageing Raccoon to ASCR Raccoon conductor

[63]R&M & Re-conductoring / refurbishment of LT line to 3-phase, 4-W line re-conductoring with ACSR Rabbit conductor

[64]Replacement of oil-filled distribution transformer (DTR) with dry-type DTR in busy places

1.1.5 CENTRAL ASSAM REGION (CAR)

PROPOSED R&M ACTIVITY AND DRNT REPLACEMET								
S. No.	Name of Electrical Circle	District	R / M – 33kV (km)	R/M - 11 kV (km)	R/M – LT (km)	[65]DTR Replace (No).	Divisional Store / Location	Remarks
1	Tezpur	Sonitpur	66 km	60 km	100 km	15	Tezpur, Dhekiajuli,	Dismantled equipment associated with R&M activities and DTR replacement will be taken to the Central warehouse or Divisional Stores
2	Nagaon	Nagaon	53 km	60 km	30 km	3	Nagaon-I & II	See comment above
3	North Lakhimpur	Lakhimpur & Dhemaji	78 km	50 km	-	-	Lakhimpur, Chariali, Dhemaji	See comment above
4	Cachar	Cachar	19.5 km	50 km	50 km	10	Silchar	See comment above
5	Badarpur	Hailakandi & Karimganj	55 km	50 km	100 km	5	Karimganj, Hailakandi,	See comment above
6	Marigaon	Marigaon	-	50 km	50 km	-	Marigaon	See comment above
	TOTAL		**271.5 km**	**320 km**	**330 km**	**33**		

1.1.6 LOWER ASSAM REGION (LAR)

PROPOSED R&M ACTIVITY, AND DTR REPLACEMENT								
S. No.	Name of Electrical Circle	District	R / M - 33kV (km)	R/M - 11 kV (km)	R/M – LT (Km)	[66]DTR Replace (No).	Divisional Store / Location	Remarks

[65]Replacement of oil-filled Distribution Transformer (DTR) with dry-type DTR in busy places

PROPOSED R&M ACTIVITY, AND DTR REPLACEMENT								
S. No.	Name of Electrical Circle	District	R / M - 33kV (km)	R/M - 11 kV (km)	R/M – LT (Km)	[66]DTR Replace (No).	Divisional Store / Location	Remarks
1	Guwahati – I	Kamrup Metro	60 km	100 km	200 km	50	Guwahati Central	Dismantled equipment associated with R&M activities and DTR replacement will be taken to the Central warehouse or Divisional Stores
2	Barpeta	Barpeta	105.5 km	-	100 km	10	Barpeta Pathsala	See above comment, Guwahati has a Central warehouse
		Nalbari					Pathsala	See comment above
		Nalbari and Partly Bagcha					Pathsala	See comment above
3	Guwahati –II	Kamrup Metro	27.5 km	100 km	150 km	30	Guwahati West / Guwahati City	See comment above
4	Mangaldoi	Darang	125 km	40 k m	100 km	-	Mangaldoi	See comment above
5	Bongaigoan	Bongaigaon	62.5 km	50 km	100 km	-	Bongaigoan	See comment above
6	Kokrajhar	Kokrajhar	17 km	-	-	7	Kokrajhar	See comment above
7	Rangia	Kamrup Rural	34 km	50 km	100 km	10	Rangia	-
		TOTAL	**431.5 km**	**340 km**	**750 km**	**107**		

REPLACEMENT OF OVERHEAD (11 kV and LT) LINES TO UNDERGROUND CABLING							
S. No.	Name of Electrical Circle	District	Replacement OH to UG - 33 kV (km)	Replacement OH to UG 11 kV (km)	Replacement OH to UG LT (Km)	Divisional Store / Location	Remarks

[66]Replacement of oil-filled DTR with dry-type DTR in busy places

PROPOSED R&M ACTIVITY, AND DTR REPLACEMENT									
S. No.	Name of Electrical Circle	District		R / M - 33kV (km)	R/M - 11 kV (km)	R/M – LT (Km)	[66]DTR Replace (No).	Divisional Store / Location	Remarks
1	Guwahati – I	Kamrup Metro		14.1 km	14.1 km	Guwahati North Guwahati East/Central	Involves: Replace OH HT 11 kV by UG (XLPE) Cable - 7.3 km x 2 of HT and LT in around Capital Complex Dispur; and - 6.8 km x 2 of HT and LT at portion of G.S. Road from Paltanbazar to Gangeshguri		
			TOTAL	**14.1 km**	**14.1 km**				

R**&M OF 33 kV BAY WITH TERMINAL EQUIPMENT**				
S, No	Name of Electrical Circle	R&M with existing 33 kV line[67]	Description	Quantity
		✓	Against R&M & re-conductoring of 33 kV S/C line from Sarusajai GSS-Fatasil SS (line length 12 km)	2
		✓	Against R&M & re-conductoring of 33 kV S/C line from Kahilipara GSS -Ulubari SS-(Ulubari Fdr.I) (line length 6 km)	2
		✓	Against R&M & re-conductoring of 33 kV S/C line from Sarusajai- Kahilipara GSS- Paltanbazar SS- conversion with D/C line from Kahilipara to Paltanbazar S/S (line length 16 km) -	2

[67]Conversion from S/C to D/C line replacing PSC pole/STP and AAAC Raccoon conductor by ACSR Wolf conductor and heightening of the line

1.2 OUTPUT 2: STRENGTHENING INSTITUTIONAL CAPACITY OF APDCL AND APGCL

1.2.1 UPPER ASSAM REGION (UAR)

AREA LOAD DESPATCH CENTRE								
S. No	Name of Electrical Circle	District	Location	Quantity	Number of Connected Sub-stations	Ownership	Benefit	Remarks
1	Jorhat	Jorhat	Jorhat City	1	20 number of 33/11 kV Sub- stations	Bidyut Bhawan, Na Ali in the middle of the City, belongs to APDCL.	Status monitoring & better load management of 33/11 kV Substations under APDCL	There are total 30 numbers of 33 kV lines and 55 numbers of 11 kV lines connected with these 20 Sub-stations.

IT MODULE FOR INTRODUCTION OF CENTRALIZED UNIFORM REVENUE BILLING SYSTEM			
S. No.	Name of Electrical Circle	**Quantity**	**Benefit**
1	Jorhat, Dibrugarh, Tinsukia, Sivasagar	To benefit 296,567 consumers	• Centralized system is Easy to Manage because of centralized location of Server. • Upgrades, Backup, Restoration are a lot easier since it is required to be set up in a centralized location. • All types of bills including energy bill, miscellaneous bill, RC-DC bill, Assessment bill are computerized. • System generated automatic disconnection notice without manual intervention • All processes related to Service Connection are fully automated. • All reports related to billing & collections of all locations are available at the centralized location. Can be accessed anytime, anywhere. So real time monitoring can be done by higher authorities. • Centralized IT helpdesk available for all billing / collection and related complaints; • Proper trail is also available for each complaints and their solutions

1.2.2 CENTRAL ASSAM REGION (CAR)

IT MODULE FOR INTRODUCTION OF CENTRALIZED UNIFORM REVENUE BILLING SYSTEM			
S. No	Name of Electrical Circle	Quantity	Benefits
1	Cachar, KANCH, Nagaon, North Lakhimpur, Tezpur	To benefit 455,159 consumers	• Centralized system is Easy to Manage because of centralized location of Server. • Upgrades, Backup, Restoration are a lot easier since it is required to be set up in a centralized location. • All types of bills including energy bill, miscellaneous bill, RC-DC bill, Assessment bill are computerized. • System generated automatic disconnection notice without manual intervention • All processes related to Service Connection are fully automated. • All reports related to billing & collections of all locations are available at the centralized location. Can be accessed anytime, anywhere. So real time monitoring can be done by higher authorities. • Centralized IT helpdesk available for all billing / collection and related complaints; • Proper trail is also available for each complaints and their solutions

1.2.3 LOWER ASSAM REGION (LAR)

AREA LOAD DESPATCH CENTRE AT GUWAHATI								
S. No.	Name of Electrical Circle	District	Location	Quantity	Number of Connected Sub-stations	Ownership	Benefit	Remarks
1	Guwahati -I	Kamrup Metro	Guwahati City	1	36	Exiting office space owned by APDCL	Status monitoring & better load management of 33/11 kV Substations under APDCL.	
SETTING UP INDEPENDENT METER TESTING LABORATORY								
S. No	Name of Electrical Circle	District	Location	Quantity		Ownership	Benefit	Remark

1	Guwahati –II	Kamrup Metro	Jalukbari, Guwahati	1	Assam Engineering College	Better management of consumer grievances	-
IT MODULE FOR INTRODUCTION OF CENTRALIZED UNIFORM REVENUE BILLING SYSTEM							
S. No	Name of Electrical Circle			Quantity	Benefit		
1	Guwahati-I, Bongaigaon, KEC, Mangaldoi, Rangia			To benefit 448,274 consumers	• Centralized system is Easy to Manage because of centralized location of Server. • Upgrades, Backup, Restoration are a lot easier since it is required to be set up in a centralized location. • All types of bills including energy bill, miscellaneous bill, RC-DC bill, Assessment bill are computerized. • System generated automatic disconnection notice without manual intervention • All processes related to Service Connection are fully automated. • All reports related to billing & collections of all locations are available at the centralized location. Can be accessed anytime, anywhere. So real time monitoring can be done by higher authorities. • Centralized IT helpdesk available for all billing / collection and related complaints; • Proper trail is also available for each complaints and their solutions		

Letter from JICA TO APDCL: No Objection / Allotment of Land at Kharguli Area for Construction

PROJECT IMPLEMENTATION UNIT
JICA ASSISTED GUWAHATI WATER SUPPLY PROJECT
SAIKIA COMMERCIAL COMPLEX, CHRISTIAN BASTI
G. S. ROAD, GUWAHATI-781005

No.PIU/JICA/GHTY/8/Pt.III/2010/264 Dated: 29th Oct., 2014

From: **Dr. Amit Sahai, IFS,**
Project Director,
Project Implementation Unit,
JICA assisted GWSP,
Guwahati.

To: **The Chief Project Manager (PIU),**
ADB/EAP, APDCL,
Paltan Bazar,
Guwahati-1.

Sub: ***JICA assisted GWSP under Loan No ID-P 201: Contract Package C#03: Request for allotment of land at Kharghuli area for construction of 33/11 KV Sub-Station – reg.***

Ref: Your letter No. CPM (PIU) / APDCL / Tech-9 /MFF-2/13-14/32 dtd 4th Sept, 2014.

Sir,

Kindly refer to your letter mentioned above vide which APDCL had requested for allotment of land at Kharghuli area for construction of 33/11 KV Sub-Station. Regarding this issue, kindly find enclosed map showing area measuring approximately 1125 sq. m. which has been kept aside for construction of 132/33 KV Sub-Station required for the Intake Well and Water Treatment Plant under the JICA assisted Guwahati Water Supply Project. This area can easily accommodate two bays required for the project as well as for domestic distribution in that area. It is further requested that the APDCL may start the construction of Sub-Station at the earliest so that the project site could have access to the required Power supply.

Yours faithfully,

Enclo: As stated.

Project Director,
Project Implementation Unit,
JICA assisted GWSP.

Memo No.PIU/JICA/GHTY/8/Pt.III/2010/264 - A **Dated: 29th Oct., 2014**

Copy for information to:

1. The Chief Executive Officer, Guwahati Metropolitan Development Authority, STATEFED Building, Bhangagarh, Guwahati-5.
2. The Team Leader, Project Management Consultancy, JICA assisted GWSP, 1st bye lane, Lichubari, Six Mile, Khanapara, Guwahati.

Project Director

Request Letter to Guwahati metropolitan Development Authority for Demarcation and Allotment of Land

OFFICE OF
THE PROJECT DIRECTOR
PROJECT IMPLEMENTATION UNIT
JICA ASSISTED GUWAHATI WATER SUPPLY PROJECT
SAIKIA COMMERCIAL COMPLEX, CHRISTIAN BASTI
G. S. ROAD, GUWAHATI-781005

No.PIU/JICA/GHTY/8/Pt.III/2010/253 Dated: 29th Sept, 2014

From: **Dr. Amit Sahai, IFS,**
Project Director,
Project Implementation Unit,
JICA assisted GWSP,
Guwahati.

To: **The Team Leader,**
Project Management Consultancy,
JICA assisted GWSP,
1st bye lane, Lichubari,
Six Mile, Khanapara, Guwahati.

Sub: ***JICA assisted GWSP under Loan No ID-P 201: Contract Package C#03: Request for allotment of land at Kharghuli area for construction of 33/11 KV Sub-Station – reg.***

Sir,

Kindly find enclosed a copy of the letter addressed to the Chief Executive Officer, GMDA, requesting him to provide a suitable plot of land near JICA assisted Guwahati Water Supply Project WTP site at Kharghuli for construction of Sub-Station. You are, therefore, requested to kindly provide the map and the area of the plot identified for construction of electrical Sub-station at WTP site at Kharghuli. This may kindly be treated as urgent and the information sought may be provided by 30th September, 2014.

Enclo: As stated.

Yours faithfully,

sd/-

Project Director,
Project Implementation Unit,
JICA assisted GWSP.

Memo No.PIU/JICA/GHTY/8/Pt.III/2010/253 - A **Dated: 29th Sept, 2014**

Copy for information to:

The Chief Project Manager (PIU), ADB/EAP, APDCL, Paltan Bazar, Guwahati-1. The necessary action is being taken in regard to the allotment of land with reference to his letter No CPM(PIU)/ APDCL/ Tech-9/MFF-2/13/14/32 dtd. 04/09/2014, addressed to the Chief Executive Officer, GMDA, Guwahati.

Project Director 29/9/14
Project Implementation Unit,
JICA assisted GWSP.

APPENDIX 2: DETAILS OF APPLICABLE ENVIRONMENTAL LAWS, REGULATIONS, AND STANDARDS

2.1 Applicable Regulations

A	ENVIRONMENTAL REGULATIONS			
S. No.	**Name of Regulation**	**Applicability**	**Remarks**	**Web-link**
1	National Environmental Policy, 2006	Yes	Mainstreaming of environmental concerns in all development activities; throughout project implementation and operation	http://moef.nic.in/modules/rules-and-regulations/environment-protction/
2	National Green Tribunal Act, 2010	Yes	For environmental related dispute that may arise due to subproject activities inTranche 2.	-
3	The Environment Protection Act; 1986 and Environment (Protection) Rules 1986 and amendments (Amended 2009)	Yes	All projects/activities/ that being developed, implemented, established, operational and/or being funded, that would discharge or emit any environmental pollutant should take cognizance of this Act/Rule and ensure compliance to the prescribed environmental standards; throughout project implemention and operation	-
4	Environmental Statement as per Rule 14 to the Environment (Protection) Rules, 1992	Yes	See above comment	
5	EIA Notification 2006 - Environmental Clearance and Public Consultation (Amended 2009)	No	Exempted from environmental clearances as notified by MOEF in September 2006.	http://moef.nic.in/modules/rules-and-regulations/environment-protction/
6	The Hazardous Waste (Management, Handling	Yes	Applicable to Tranche 2 during construction and operation Stage	http://www.moef.nic.in/le

A	ENVIRONMENTAL REGULATIONS			
S. No.	**Name of Regulation**	**Applicability**	**Remarks**	**Web-link**
	and Trans-boundary Movements) rules, 2008 (Amended 2010)			gis/hsm.htm
7	Batteries (Management and Handling) Rules, 2001 and further amendments	Yes	Applicable to Tranche 2 in case of any activity being implemented/ operational that involve the handling, purchase and use of batteries	http://www.moef.nic.in/legis/hsm.htm
8	Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005	No	-	http://moef.nic.in/modules/rules-and-regulations/environment-protction/
9	Forests (Conservation) Act, 1980 and Rules 1981 (Amended 2004)	Yes	All projects/activities being conceptualized, developed, implemented or funded within forest areas or depend on use of forest should take cognizance and comply with the provisions of these rules and obtain required clearances from the Forest Department	http://moef.nic.in/modules/rules-and-regulations/forest-conservation/
10	The Wildlife (Protection) Act, 1972 (Amended 2010)	Yes	All projects/activities being conceptualized, developed, implemented and/or funded within wildlife sanctuaries or national parks should take cognizance and comply with the provisions of these rules and obtain required clearances from the National Board for Wildlife /Chief Wildlife Warden	http://moef.nic.in/modules/rules-and-regulations/wildlife/
11	The Wildlife Protection Strategy, 2002	Yes	All projects/activities being conceptualized, developed, implemented or funded within 10 km of wildlife sanctuaries or national parks should take note of the measures suggested in this Strategy document.	http://envfor.nic.in/divisions/wild.html

A	ENVIRONMENTAL REGULATIONS			
S. No.	**Name of Regulation**	**Applicability**	**Remarks**	**Web-link**
12	The Biodiversity Act, 2002	Yes	An umbrella legislation aimed at conservation of biological resources and associated knowledge as well as facilitating access to them in a sustainable manner and through a just process.	
13	Wetlands (Conservation & Management) Rules, 2010	No	Subprojects will not affect wetlands.	http://moef.nic.in/modules/public-information/home-archive/
14	The Air (Prevention and Control of Pollution) Act, 1981 Including Rules 1982 and 1983	Yes	During construction stage	-
15	Noise Pollution (Regulation and Control) Rules, 2000 and the Noise Pollution (Regulation and Control) (Amendment) Rules, 2010	Yes	During construction and operation phase	http://moef.nic.in/modules/public-information/home-archive/
16	The Water (Prevention and Control of Pollution), Act, 1974 including Rules, 1975 (as amended up to 1988)	Yes	During construction and operation stage	-
17	The Water (Prevention and Control of Pollution), Cess Act, 1977 including	Yes	During construction and operation stage, as applicable	

A	ENVIRONMENTAL REGULATIONS			
S. No.	**Name of Regulation**	**Applicability**	**Remarks**	**Web-link**
	Rules 1978 and 1991			
18	The Indian Forest Act 1927	Yes	All projects/activities being conceptualized, developed, implemented and/or funded within forests should take cognizance and comply with the provisions of these rules and obtain required clearances from the MOEF	-
19	The National Environmental Appellate Authority Act, 1997	Yes	Applicable to any person aggrieved by an order granting environmental clearance in the areas in which any industries, operations or processes or class of industries, operations and processes shall not be carried out or shall be carried out subject to certain safeguards may, within thirty days from the date of such order, prefer an appeal to the Authority in such form as may be prescribed	http://assets.wwfindia.org/downloads/block_2__unit_5.pdf
20	Notification on Special Areas/ Restricted Activities	No	Notification deals with environmental issues in specific notified zones/areas in different regions and imposition of restrictions/prohibitions on certain industries or activities	http://moef.nic.in/modules/rules-and-regulations/environment-protction/
21	National Board for Wildlife (NBW)	Yes	Guidelines for linear infrastructure intrusions in natural areas pertaining to roads and power lines; stipulates that 'to prevent electrocution deaths of Asian elephants, the height above the ground at the lowest point of the lowest conductor or grounding wires (at the maximum sag point) of power lines, whether insulted or bare, passing through all natural areas with known presence or movement of Asian elephants, shall be a minimum of 20 ft. (6.6 meters) above the ground on level terrain (less than 20 degrees) and a minimum of 30 feet (9.1 meters) above the ground on steeper terrain (slope of more than 20 degrees).	-
22	Central Electricity	Yes	Guidelines for laying transmission and distribution lines of 33 kV and 11 kV voltage grade in areas critical from the point of view of	Central Electricity

A	ENVIRONMENTAL REGULATIONS			
S. No.	**Name of Regulation**	**Applicability**	**Remarks**	**Web-link**
	Authority (CEA)		saving wildlife suggest provision of suitable spikes provided on 33 kV and 11kV poles at the height of 1.21 meters (four feet) and 2.1 meters (seven feet) to ward off animals coming close to the poles and damaging them by rubbing their bodies against them, particularly elephants. Such poles shall be provided and maintained in animal corridors affected by R&M activity.	Authority (CEA)
23	The Electricity Act, 2003	Yes	-	
24	Forest (Conservation) Act, 1980, amended 1988 (National Forest Policy, 1988) • Forest (Conservation) Rules, 1981 amended 1992 and 2003 • Guidelines for diversion of forest lands for non-forest purpose under the Forest (Conservation) Act, 1980	Yes	The Forest Conversation Act (1980) provides guidance on the right-of-way (ROW) and tree cutting. Where routing of distribution lines through the forest areas cannot be avoided, these should be aligned in such a way that it involves the least amount of tree cutting. Below each conductor, a width clearance of 3 meters (m) would be permitted for the movement of tension stringing equipment. The trees on such strips would have to be felled but after stringing work is completed, the natural vegetation will be allowed to regenerate. Felling/pollarding/pruning of trees will be done with the permission of the local forest officer whenever necessary to maintain the electrical clearance. One outer strip shall be left clear to permit maintenance of the power line. Under the Act, for distribution line voltage of 33 kV, the width of ROW is equal to 7 m and for distribution line voltage of 11 kV, the width of ROW is equal to 15 m	

B	SOCIAL REGULATIONS RELATED TO LAND AND LABOUR			
S. No	**Type of Regulation**	**Applicability**	**Remarks**	Web-link
1	The Land Acquisition Act, 1894 and 1984 amendments	No	No acquisition of private land	-
2	The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & rules 2007	No	Tranche 2 subprojects not situated in tribal land.	-
3	The Provision of the Panchayats (Extension to the Scheduled Areas) Act, 1996	Yes	-	-
4	The Indian Telegraph Act, 1885	No	Only if APDCL has to setup its own power evacuation corridor	-
5	Indian Treasure Trove Act, 1878 (as modified up to September 1949)	No	Only if APDCL subproject activities affect such sites	-
6	The Antiquities and Art Treasures Act, 1972	No	Only if APDCL subproject activities affect such sites	-
7	The Child Labour (Prohibition and Regulation) Act, 1986	Yes	-	http://labour.nic.in/cwl/ChildLabour.htm
8	The Bonded Labour (Abolition) Act 1976	Yes	APDCL does not engage with bonded labor	-
9	The Trade Union Act, 1926	No	-	-
10	Minimum Wages Act, 1948	Yes	For workers during construction and operation stage	-

B	SOCIAL REGULATIONS RELATED TO LAND AND LABOUR			
S. No	**Type of Regulation**	**Applicability**	**Remarks**	Web-link
11	Workmen's Compensation Act, 1923 (Amended 2009)	Yes	ESI Act or Workmen Compensation Act applicable to APDCL	http://labour.nic.in/ss/Notification.html
12	The Contract Labour (Regulation & Abolition) Act, 1970 and Rules	Yes	For workers during construction and operation stage	-
13	The E.P.F. and Miscellaneous Provisions act, 1952	Yes	-	-
14	Factories Act 1948	Yes	For workers related safety during Construction; and in-case APDCL has more than ten full time employees during the operations phase of the project	-
15	ESI Act, 1948 (Employees State Insurance Act, 1948)	Yes	ESI Act or Workmen Compensation Act applicable to APDCL	-
16	Payment of Gratuity Act, 1972	Yes	-	-
17	Employers' Liability Act No. 24 of 1938	Yes	-	-
18	Building and Other Construction Workers Act 1996	Yes	Key legislations providing guidelines for onsite labour and worker management and welfare	h-ttp://labour.nic.in/clc/welcome.html#leg
19	Interstate Migrant Workers Act 1979	Yes	In case workers and labourers working at the project sites are migrants from other states	-

B	SOCIAL REGULATIONS RELATED TO LAND AND LABOUR			
S. No	**Type of Regulation**	**Applicability**	**Remarks**	Web-link
20	State Specific Shops and Establishment Act	Yes	Specific to state of establishment	-

C	OCCUPATIONAL HEALTH AND SAFETY			
S. No	**Name of Regulation**	**Applicability**	**Remarks**	**-**
1	The Indian Factories Act, 1948 and State Rules	Yes, partly	Covers aspects of Occupational and Safety	-
2	The Shops and Establishment Act and State Rules	Yes	-	-
3	The Petroleum Act, 1934 and the Petroleum Rules	Yes	-	-
4	Gas Cylinder Rules and Static and Mobile Pressure Vessels (Unfired) Rules, 1981	Yes	For any pressurized liquid stored or handled on site	-
5	Central Electricity Authority (Safety Requirements for Operation, Construction and Maintenance of Electric Plants and Electrical Lines) Regulations 2008	Yes	-	-
6	Indian Electricity Rules, 1957 (Amended 2000)	Yes	It provides for regulating the supply, transmission, generation, and use of electricity which includes precautionary measures to be adopted in construction, installation and maintenance of transmission, distribution, generation and use of electricity.	http://powermin.nic.in/acts_notification/electricity_act2003/preliminary.htm

2.2 Relevant Acts of Government of Assam

S. No.	Regulations , Acts, and Legislation
1	Assam Ancient Monuments and Records Act, 1959.
2	Assam Forest Regulation, 1891 (Assam Regulation 7 of 1891) as applied vide Meghalaya Forest Regulation (Application & Amendment) Act, 1973 (Meghalaya Act 9 of 1973)
3	Assam National Park Act, 1968
4	Assam Land and Revenue Regulation, 1886
5	Assam Irrigation Act, 1983
6	Assam Fishery Rules, 1953
7	Assam Forest Policy, 2004
8	Assam Government's Guidelines for Compensatory Afforestation, 2000
9	Assam Panchayat Act, 1994
10	Assam Khadi and Village Industries Board Act, 1955
11	Assam Forest Protection Force Act 1986
12	Assam Cooperative Agriculture and Rural Development Act 1960

2.3 India and International Environmental Agreements

a) India ismember of almost all major Multilateral Environmental Agreements(MEAs), under four clusters,namely the following:

i. Nature conservation;

ii. Hazardous material;

iii. Atmospheric emissions; and

iv. Marine environment.

b) There are over 500 active agreements/MOUs etc. to which India is signatory.

c) There are 20 major multilateral global MEAs to which India is a signatory. These are listed below:

i. Nature conservation

- Ramsar Convention on Wetlands
- CITES (Convention on International Trade in Endangered Species of Fauna and Flora)
- TRAFFIC(The Wildlife Trade Monitoring Network)
- CMS (Convention on the Conservation of Migratory Species)
- CAWT(Coalition Against Wildlife Trafficking)
- CBD(Convention on Biological Diversity)
- ITTC(International Tropical Timber Organization)
- UNFF(United Nations Forum on Forests)
- IUCN (International Union for Conservation of Nature and Natural
- Resources)
- GTF(Global Tiger Forum)

ii. Hazardous material

- Cartagena Protocolon Biosafety
- SAICM (Strategic Approach to International Chemicals Management)
- Stockholm Conventionon Persistent Organic Pollutants(POPs)
- Basel Convention on the Control of Trans-boundary Movement of
- Hazardous Waste and Their Disposal
- Rotterdam Convention on Prior Informed Consent (PIC) for certain
- Hazardous Chemicals and Pesticides in International Trade

iii. Atmospheric emissions

- UNFCCC (United Nations Framework Convention on Climate Change)
- Kyoto Protocol
- UNCCD (United Nations Convention to Combat Desertification)
- Montreal Protocol (on Ozone Depleting Substances)

iv. Marine environment

- IWC(International Whaling Commission)

Source: MoEF, India

2.4 ADB Prohibited Investment Activities List (PIAL)

1. Production or activities involving harmful or exploitative forms of forced labour[68]or child labour[69]
2. Production of or trade in any product or activity deemed illegal under host country laws or regulations or international conventions and agreements or subject to international phase outs or bans, such as pharmaceuticals[70], pesticides, and herbicides[71],(b) ozone-depleting substances[72], (c) polychlorinated biphenyls[73] and other hazardous chemicals[74], (d) wildlife or wildlife products regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora[75], and (e) trans-boundary trade in waste or waste products[76]
3. Production of or trade in weapons and munitions, including paramilitary materials
4. Production of or trade in alcoholic beverages, excluding beer and wine[77]
5. Production of or trade in tobacco
6. Gambling, casinos, and equivalent enterprises
7. Production of or trade in radioactive materials[78], including nuclear reactors and components thereof

[68]Forced labour means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty

[69]Child labour means the employment of children whose age is below the host country's statutory minimum age of employment or employment of children in contravention of International Labor Organization Convention No. 138 "Minimum Age Convention"(www.ilo.org).

[70] List of pharmaceutical products subject to phaseouts or bans is available at http://www.who.int.

[71] A list of pesticides and herbicides subject to phaseouts or bans is available at http://www.pic.int.

[72] A list of the chemical compounds that react with and deplete stratospheric ozone resulting in the widely publicized ozone holes is listed in the Montreal Protocol, together with target reduction and phaseout dates. Information is available at http://www.unep.org/ozone/montreal.shtml.

[73]A group of highly toxic chemicals, polychlorinated biphenyls are likely to be found in oil-filled electrical transformers, capacitors, and switchgear dating from 1950 to 1985.

[74] A list of hazardous chemicals is available at http://www.pic.int.

[75] A list is available at http://www.cites.org.

[76] As defined by the Basel Convention; see http://www.basel.int.

[77] This does not apply to investee companies who are not substantially involved in these activities. Not substantially involved means that the activity concerned is ancillary to an investee company's primary operations.

8. Production of, trade in, or use of un-bonded asbestos fibres[79]
9. Commercial logging operations or the purchase of logging equipment for use in primary tropical moist forests or old growth forests
10. 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.

[78] This does not apply to the purchase of medical equipment, quality control (measurement) equipment, and any equipment for which ADB considers the radioactive source to be trivial and adequately shielded.
[79] This does not apply to the purchase and use of bonded asbestos cement sheeting where the asbestos content is less than 20%.

APPENDIX 3: LOCATIONAL ANALYSIS OF THE NEW SUBSTATION

S. No	Description of Information	33 /11 kV Substation (Capacity 2 x 10 MVA)	
1	Location	Kharghuli	
2	District	Kamrup Metro	
3	Taluk	Kharghuli	
4	Electrical Circle	Guwahati Electrical Circle -I	
	Latitude / Longitude	26°11'53" N / 91°46'8"E	
5	Land Details		
		Area of Land	0.13 ha for substation, total land 4.3 ha.
		Slope / Plain Land	Uneven and sloping area towards the south-west
		Approximate amount of land cutting required	No cutting; will require backfilling.
		Ownership Status	Land belongs to Guwahati Metropolitan Authority; APDCL has obtained a No Objection Letter on 1/2/2013. Site has an on-going project supported by JICA for Water Supply
4	Distance from Nearest		
		River	Brahmaputra, 100 m
		Highway	2 km
		Forest Area	-
		City / Town	10 km
		Protected Area	60 km, Pobitora Sanctuary
		Airport	25 km Lokpriya Gopinath Bordoli
		Households	Semi-permanent dwellings x 2 situated within the site area; Closest residential area starts right outside the main site at a distance of 250 to 300 m
		Road	Pucca road situated at a distance of 250 to 300 m; site will require a paved access road
		Existing HT Line	10 to 20 m
5	Vegetation		
		Type of Vegetation	Shrubs, otherwise muddy
		Tree Cutting	No, no forest trees, non-forest trees or fruit trees to be felled. The site has an old Neem tree on the site. It will not be cut down.
		Tree Lopping	No

APPENDIX 4: STAKEHOLDER CONSULTATION AT SELECT SITES

4.1 SITE VISITS, SEPTEMBER 2014

	
Consultation with representative of Amingaon Industrial Association for new 6km 33kV line through Saraighat Bridge link between Jalukbari to Amingaon	Consultation with Traders Assocaition of Pathshala Town for New 20km 33kV line Barnagar GSS to Howly
	
Consultation with people of Bordubi at sub station for the R&M of 22Km 33 kV line from Tinsukia GSS to Bordubi	Consultation with people at Kowang sub station for the new line of 20Km 33 kV line from Behiating GSS to Cowing SS
	
Consultation at Titabar Sub station for R&M of	Consultation at Komarbandha Sub station for R&M

24 km 33 kV line from Titabar to Barhola	of 10 km 33 kV line from Tetlitol GSS to Komarbandha

4.2 SIGNED ATTENDANCE SHEET

TA-8351 IND: Advanced Project Preparedness for Poverty Reduction - Preparing the Second Power Sector Investment Project for Assam) - Consultation Document

NEW 33KV LINE (6KM) THROUGH SARAIGHAT BRIDGE LINK BETWEEN JALUKBARI TO AMINGAON

Attendance sheet

Date: 18 // 09 // 2011 Place Amin Gaon Residential Association

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number & SIGNATURE
1)	KRISHNA KR. BAJAJ.	Director/Patron	Aminpara	94350-42214
2.	Nikhil Agarwal	Manager-Finance	Bamunimaidan	9864980912
3.	Sanjib Sarma.	Accountant	Santipur	9706011121
4.	Barnali Sarma	Accountant	Mirza	9706098724
5.	Champak Goswami		Nalbari.	97060-98720

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TA-8351 IND: Advanced Project Preparedness for Poverty Reduction - Preparing the Second Power Sector Investment Project for Assam) - Consultation Document

Attendance sheet

Date: 18 // 09 // 2011 Place SUALKUCHI TOWN

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number
1	NABA KUMAR SARMA	Branch Manager	SBI, Sualkuchi	9435087550
	~~[illegible]~~	~~[illegible]~~	~~Handloom~~	
2	MRIDUL BHARALI	OWNER	LOCAL HANDLOOM OWNER	9864294853
3	NAGEN BAISHYA	House owner		9864079269
4.	SANTANU MEDHI	BRANCH MANAGER	HDFC Bank Ltd	9613440190

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Construction of 11kV line (3km) for Sualkuchi Town

TA-8381 IND: Advanced Project Preparedness for Poverty Reduction - Preparing the Second Power Sector Investment Project for Assam) - Consultation Document

Attendance sheet

Date: 19.09.2014 Place: PATHSALA (BAJALI)

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number & SIGNATURE
1	GIRISH PATGIRI	Secy, Pathsala Bazar Committee	Pathsala	[illegible]
2	MADAN Roy	Pathsala	-	[illegible]
3	PHANI BHUSAN TALUKDAR		Pathsala	[illegible]
4	DWIJENDRA LAL DAS	President, Pathsala Sahitya Sabha	Pathsala	[illegible]
5	Mridul Talukdar	Gen. Sec.	A.J.Y.C.P. Bajali	[illegible]
6	Khanin Das.			
8	JAHIR Ali			
9	Rajib Kalita			
10	Pranab Pathi Sarma			
11	MRINAL CHOUDHURY.			[illegible] 19/9/14
12	Dhruba Roy			
13	Sati ch Roy			
14	NIPEN KALITA			
15	Pranab Talukdar.			[illegible] 19/9/14

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Attendance sheet

Date: 19.09.2014 Place: PATHSALA

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number & SIGNATURE
16	Bulbul Talukdar	Businessman	Pathsala	[illegible]
17	Hriday Patgiri	President, Pathsala Bazar Committee	Pathsala.	Patgiri.
18	Amiya Patgiri	Business	Pathsala	[illegible]
19	Tarak Nath Sarma	Business	Pathsala	[illegible]
16	Dhiraj Talukdar	Busi..	Pathsala	[illegible]
21	JADAB CH. BAISHYA	Business	Pathsala.	[illegible]
22	Priya Talukdar.	"	"	[illegible]
23	Abhi Choudhury	Social worker	Pathsala	[illegible]
24	PRAPULLA KAKATI	"	"	[illegible]
25	Lobanya Patgiri	Business	Pathsala	[illegible]
26	DIPAK Choudhury	Bazar Committee	Pathsala	[illegible]
27	Bulal Talukdar	Businessman		[illegible]
28	[illegible]	[illegible]	[illegible]	[illegible]
29	Ajit Das	Businessman	Pathsala	Ajit Das

15

New 33 kV line(20kms) Barnagar GSS to Howly line (20km) with GI STP (SP-76) & ACSR wolf conductor and terminal equipment at Barnagar GSS and Baki River crossing by B+6 tension type tower.

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Attendance sheet

Date: 22 // 09 // 2014 Place BORDOBI Substation

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number & SIGNATURE
1.	SRIMATA SENAPATI	DY Manager	BOR DOBI Substation	[illegible] 22/09/14
2,	Nevaram Kalita	AGM, Dibrugarh	Dibrugarh	[illegible]
3	Rijjal Medhi	Village Head	Bordubi	[illegible] Medhi
4	Kiran Agri	Consumer	Tongapath	[illegible]
5	Sri Ripon Kr. Gogoi	G.P. President	Bordubi K.G.P	[illegible]
6	Sri Bisworjyoti Baruah	Social Worker	Bordubi	[illegible]
7	Sri Partha Pratim das	Social Worker	Bordubi	[illegible]
8	Sri Ram Janam Sah	[illegible] (AAPGU)	Bordubi	[illegible]
9.	Sri Rabb Borah	Mondal President	Bordubi K.G.P	[illegible] 22/09/14
10	Mayur Jyoti Bharadwaj	Junior Manager	Bordubi Electrical S/D	[illegible] 22/09/14
11	Sri Tileswar Saikia	Lineman	Bordubi.	
12	Madhurjya Gogoi	SAHAYAK	Bordubi	Gogoi
13	kantala [illegible] konwar	Peon	Bordubi	
14	ARUN BIKASH BAROI	Cashier	Bordubi	9435492804 [illegible]

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Attendance sheet

Date: 22 // 09 // 2014 // Place BOR DOBI Substation

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number & SIGNATURE
15	Prakash Bohal.	LDA	BESD.	[illegible]
16	ABHIJIT PHUKAN	BILL CLERK	R.E.S.D	[illegible]
17	Uttam Dutta	Fireneche	Bordubi	[illegible]

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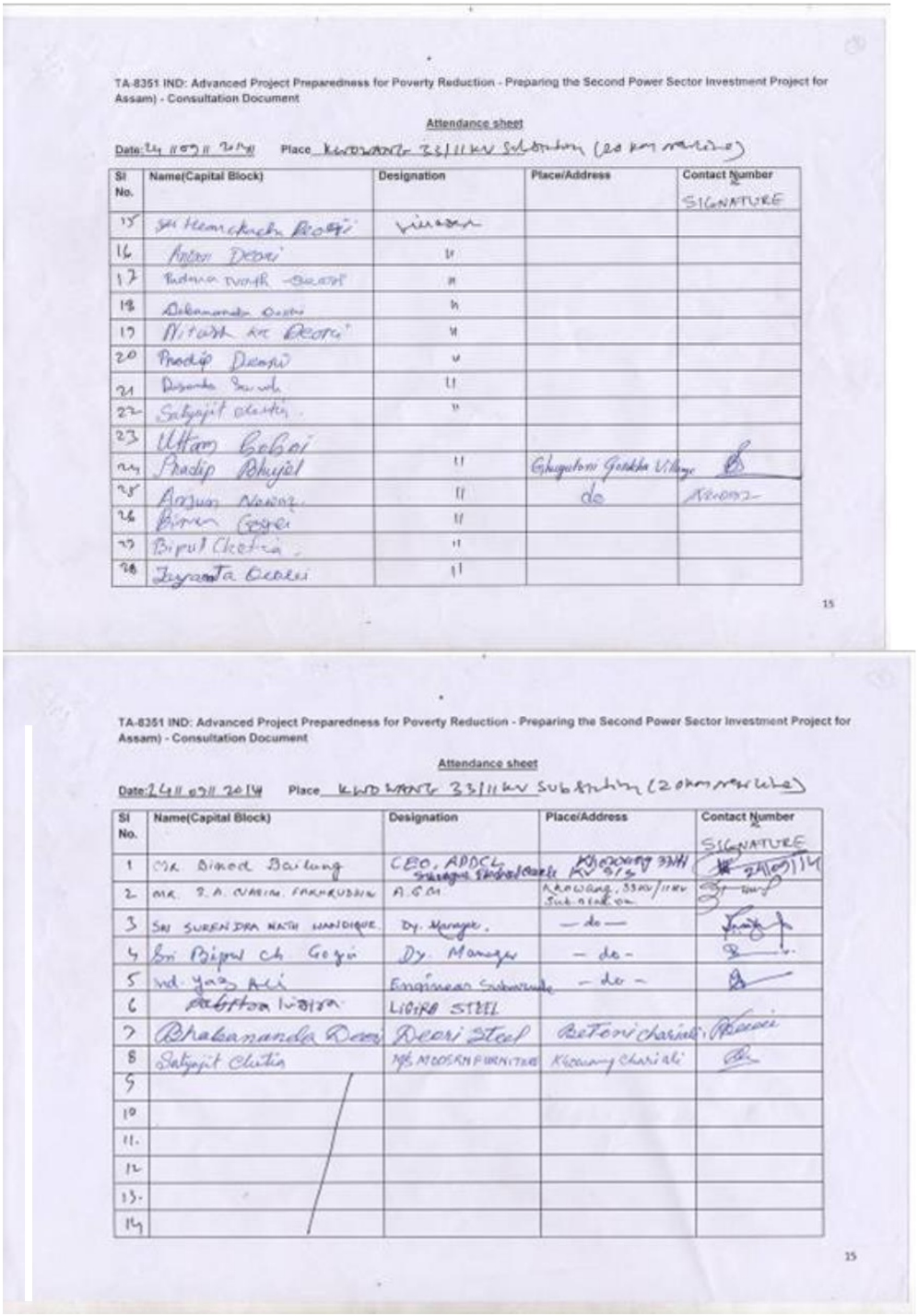
R&M of 33 kV line from Tinsukia GSS to Bordubi S/S (22 km) with PSC Pole & ACSR Wolf Conductor



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Attendance sheet

Date: 24/07/2014 Place KWOWANG 33/11 KV Substation (20 km route)

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number / SIGNATURE
15	Sri Hemchandra Bodo	Villager		
16	Anjan Deori	"		
17	Padma Nath Basumatary	"		
18	Bikramanda Doley	"		
19	Nitesh Kr Deori	"		
20	Pradip Deori	"		
21	Basanta Swami	"		
22	Satyajit Chetia	"		
23	Uttam Bodoi			
24	Pradip Bhujel	"	Ghugutoni Gaokha Village	
25	Arjun Nawaz	"	do	
26	Biren Gogoi	"		
27	Bipul Chetia	"		
28	Jayanta Deori	"		

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Attendance sheet

Date: 24/07/2014 Place KWOWANG 33/11 KV SUB STATION (20 km route)

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number / SIGNATURE
1	MR. Dinod Bailung	CEO, ADDCL	Kwowang 33/11 KV S/S	24/07/14
2	MR. S.A. YASMIN FAKHRUDDIN	A.G.M	Kwowang, 33KV/11KV Sub-station	
3	SRI SURENDRA NATH MAHDIQUE	Dy. Manager.	— do —	
4	Sri Bipul Ch Gogoi	Dy. Manager	- do -	
5	md. Yaqub Ali	Engineer Substation	- do -	
6	Rabiram Narzary	LIGIRA STEEL		
7	Bhakananda Deori	Deori Steel	Betoni chariali, Kwowang	
8	Satyajit Chetia	M/S MODERN FURNITURE	Kwowang Chariali	
9				
10				
11.				
12				
13.				
14				

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Construction of 33 kV line (20 km) from Kwowang 33/11 kV S/S to Behaiting GSS (both end bay with Terminal equipment) & Kwowang SS with one Railway crossing

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Attendance sheet

Date: [illegible] Place BARHOLLA

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number SIGNATURE
1	Amarjit George	Villager	Gorajan	[illegible]
2	Jitul Sonowal	"	[illegible]	Sonowal
3	[illegible]	"	[illegible]	[illegible]
4	[illegible] Rahman	"	Borhalla	[illegible]
5	Sri Dimbeswar Chetia	"	[illegible]	[illegible]
6	Sri [illegible]	"	[illegible]	[illegible]
7	Sri Mohan Sonowal	"	[illegible]	[illegible]
8	[illegible]	"	[illegible]	[illegible]
9	Sri Durgeswar [illegible]	"	[illegible]	[illegible]
10.	[illegible] Chetia	"	Borhulla	Chutia
11	Sri [illegible]	"	[illegible]	[illegible]
12	Sri Ramen Dutta	"	INO Bolack	Ramen Dutta
13	[illegible] Rohengia	"	Gorajan	Rohengia
14	[illegible]	"	Gorajan	[illegible]

15

R&M of 33 kV line (24 km) from Titabar to Barhola with PSC Pole & ACSR Wolf Conductor

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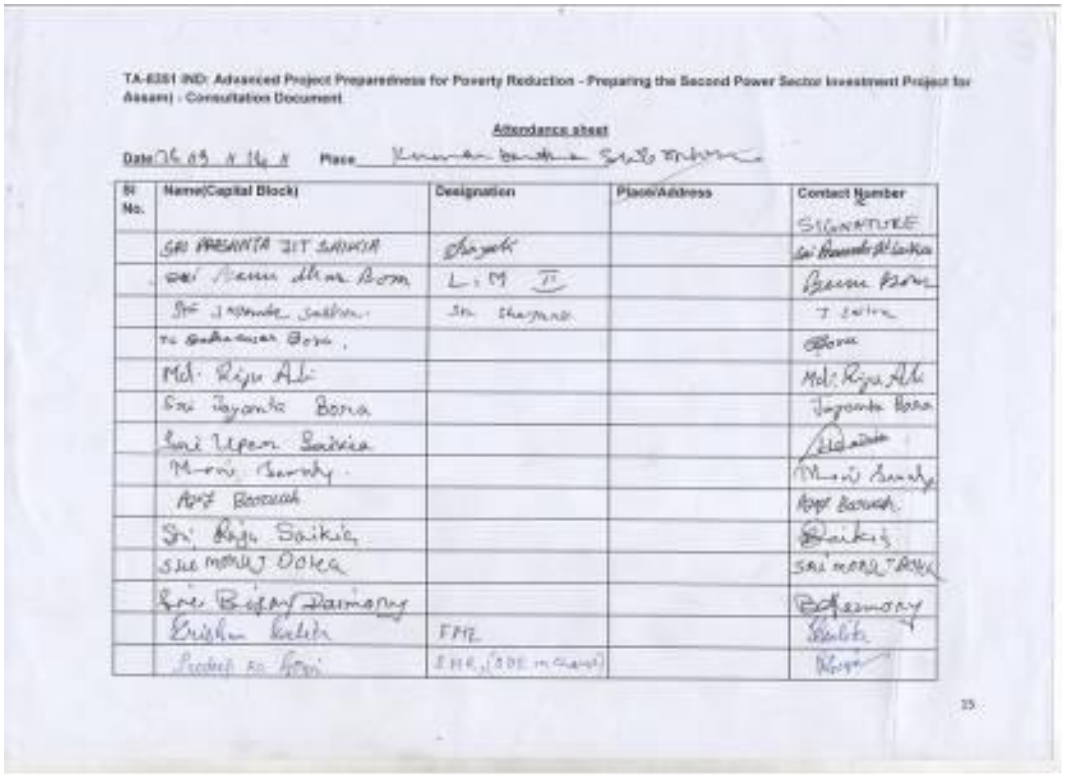
Attendance sheet

Date: 26 // 09 // 2014 Place BARAPUJIA, NAGAON ELECTRICAL CIRCLE

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number SIGNATURE
	[illegible] Patar	(K.M.S.) [illegible]	Barapujia	[illegible]
	Sri Nomal Ch. Deka	(KMSS) -do-	Barapujia	[illegible]
	[illegible]	" [illegible]	"	9954455548 [illegible]
	[illegible] Saikia	" [illegible]	"	[illegible]
	Narayan [illegible]	" [illegible]	"	Narayan [illegible]

15

R&M of 33 kV line from Barapujia to J B Garh (15 km) with PSC Pole & ACSR Wolf Conductor



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Attendance sheet

Date 16.09 & 16.9 Place

Sl No.	Name(Capital Block)	Designation	Place/Address	Contact Number SIGNATURE
	SRI PRASANTA JIT SAIKIA			
	Md. Raju Ali			
	Sri Jayanta Bora			

15

R&M of 33 kV line from Tetelitol GSS to Komarbondha 33/11kV S/S with PSC Pole & ACSR Wolf Conductor

4.3 STAKEHOLDERS CONSULTATION – ABSTRACT

Sl. No.	Place & Date	Participants	Issues discussed	Opinion & consensus about the Project
1.	Amingaon 18.09.2014	Officials of APDCL,Representatives of Amin Gaon Industrial Association and residents of Sial kutchi town Total participant -10, Attendance sheet placed in annexure 5	1.Details of project 2. Current Power situation. 3. Proposed future improvement due to new line 3.Employment opportunity and future potential	It was noted with the satisfaction that proposed project(for 6.kms new 33 kV line from Jalukbari to Amin gaon will improve the power situation for more than 200 industries located in Amin Gaon Industrial area inadition more than 150 industrial unit located in Brhama putra Induatrila park will also receive the same benefit .Due to constant fluctuation of power with low voltage situation for more than 8hrs a day affect the industrial production of SSI like foodprocessing, plastics,cosmetics,medicine

				industries located in this area. As alternative power supply ,they have to use the generator set for constant power supply which is costly(according to them the APDCL power per unit cost around Rs.6/per unit whereas the gen-set power cost around Rs 11/unit). The proposed new line will benefit them immensely to reduce the cost of production etc. More over new industrial unit will be located and thus employment generation prospects of local people will boost the economy. The association is willing to cooperate by all means to implement the project successfully.
2.	Pathsala 19/09/2014	Officials of APDCL, Traders Association, Pathsala Town, local residents consultant & Survey team Total participant -28, Attendance sheet placed in annexure 5	1.Details of project 2. Current Power situation. 3. Proposed future improvement due to new line 3.Employment opportunity and future potential of development 4. compensation for crops and trees	The pathsala town is bordering the Bhutan. Due to frequent load shedding, power tripping, voltage fluctuation etc. hampering the retail and wholesale business. The SSI and trading business is the worst suffers. They welcomed the proposed sub project which will provide them relief to some extent. The business and trade activity will improve thus improvement in the economic activity and employment generation. The villagers wanted to know the rate and type of compensation while erecting new line. All the stakeholders promised cooperation and support as the sub project will help them to improve the quality of life. The school and college going students will be able to relive from load shedding etc. Majority of villagers perceive that the youths being educated, will get jobs during construction and after the construction of the project.

3.	Bordubi 22/09/2014	Officials of APDCL, Public representative of Bordobi town, local residents, village Panchyat representative consultant & Survey team Total participant -17, Attendance sheet placed in annexure 5	1.Details of project 2. Current Power situation. 3. Proposed future improvement of line 3.Employment opportunity and future potential of development 4. compensation for crops and trees	The current line is overloaded and the capacity utilization of the current line is more than 200 percent. There are more than 12 domestic consumenr,60 SSI,150 tea gardens are dependent on this supply line The R&M of 22 km 33 kV line from Tinsukia GSS to Bordubi S/S will improve the quality of power supply from the current situation. The improved power distribution after refurbishment will enhance the capacity and reduce the power transmission loss. The school and college going students will also get benefit from this sub project as the frequent tripping will reduce. Villagers also wanted to know the rate of compensation, and they were made ware of rate changes and/or increments if any.
4.	Kwowang 24/09/2014	Officials of APDCL,Public representative of Bordobi town, local residents,village Panchyat representative consultant & Survey team Total participant -28, Attendance sheet placed in annexure 5	1.Details of project 2. Current Power situation. 3. Proposed future improvement of line 3.Employment opportunity and future potential of development 4. compensation for crops and trees	The construction of 33 kV new line (20km) from Kwowang S/S to Behaiting GSS will improve the power situation of 20-25 km radius of the area. Around 100 villages with 60 rice mill, 70 tea estate and lift irrigation facility will improve. Due to power driven proper lift irrigation facility will improve the cropping intensity and pattern. This situation will help them for economic upliftment. People in all villages unequivocally support the project as it would benefit them. Majority of villagers perceive that the youths being educated, will get jobs during construction and after the construction of the project.
5.	Barhola 25/09/2014	Officials of APDCL,Public representative of villages in and around Barhola, local residents,village Panchyat representative consultant & Survey team Total participant -14,	1.Details of project 2. Current Power situation. 3. Proposed future improvement of line	The R&M of 33 kV line (24 km) from Titabar to Barhola will help to improve the power situation for 40 rice mills,20 tea estates, and around 80villages(7000 domestic consumers). People in all villages unequivocally support the project as it

		Attendance sheet placed in annexure 5	3.Employment opportunity and future potential of development 4. compensation for crops and trees	would benefit them.
6.	Komarbandha 26/09/2014	Officials of APDCL,Public representative of villages in and around Komarbandha, local residents,village Panchyat representative consultant & Survey team Total participant -15, Attendance sheet placed in annexure 5	1.Details of project 2. Current Power situation. 3. Proposed future improvement of line 3.Employment opportunity and future potential of development 4. compensation for crops and trees	The R&M of 33 kV line from Tetelitol GSS to Komarbondha 33/11kV S/S will facilitate to improve the power supply around 25000 domestic consumer,60 rice mill,12 tea estate and lift irrigation facilities. The villagers opined that improved power supply will reduce the fluctuation and proper power supply in winter time for crop cultivation which will in turn help better and higher agricultural productivity.
7.	Barapujia 26/09/2014	Officials of APDCL,Public representative of villages in and around Barapujia, local residents, village Panchyat representative consultant & Survey team Total participant -06, Attendance sheet placed in annexure 5	1.Details of project 2. Current Power situation. 3. Proposed future improvement of line 3.Employment opportunity and future potential of development 4. compensation for crops and trees	R&M of 33 kV line from Barapujia to J B Garh (15 km) will improve power supply for nearly 5000 domestic consumer,15 rice mill and 10 tea estate. The villagers welcomed the project and also asked about the compensation rate and method of payment of compensation. It was informed them that crop compensation will be paid if there is any loss as per prescribed schedule of rate. As far as possible the private tree cutting will be avoided. If there is any impact on trees, compensation will be paid as per replacement cost. Majority of villagers perceive that the youths being educated, will get jobs during construction and after the construction of the project.