Cover Page

Environmental and Social Impact Assessment (ESIA) Report

for

Expansion and Strengthening of Power System Network Project under Chattogram Area

Acknowledgments

The Center for Environmental and Geographic Information Services (CEGIS), a public Trust under the Ministry of Water Resources, has been entrusted with the responsibility of conducting an Environmental and Social Impact Assessment (ESIA) study for the proposed "Expansion and Strengthening of Power System Network Project under Chittagong Area" by the Power Grid Company of Bangladesh Ltd (PGCB). CEGIS expresses its gratitude to the PGCB, especially to Mr. Masum-Al-Beruni, Managing Director, PGCB, for assigning the task.

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Table of Contents

Acknowledgments ..... **i**
List of Tables ..... **x**
List of Figures ..... **xiii**
List of Maps ..... Error! Bookmark not defined.
Abbreviations and Acronyms ..... **xvii**
Executive Summary ..... **xx**
1. Introduction **1**
1.1 Background of the Study 1
1.2 Objective of ESIA Study 1
1.3 Scope of ESIA Study 2
1.4 Study Area 2
1.5 ESIA Study Team 6
1.6 Study Timeline 6
1.7 Structure of the Report 7
2. Legislative and Administrative Framework **9**
2.1 Overview 9
2.2 National Legislations 9
2.3 Categorization of Projects or Industrial Units 10
2.4 Relevant National Policies 16
2.5 Asian Infrastructure Investment Bank (AIIB) Environmental and Social Framework 18
2.6 Screening and Categorization Requirements 18
2.7 Implication of Legal Aspects on this Project 19
2.8 Administrative Procedures for Obtaining Location/Environmental Clearance 19
2.9 Organization Related to Enforcement of Environmental Standards 21
2.10 Comparison with IFC Standards and Justifications of their Requirements 22
2.11 Air Quality 22
2.12 Water Quality 23
2.13 Noise Quality 23
3. Approach and Methodology **25**
3.1 Approach 25

3.2 Project Design and Description 25
3.3 Environmental and Social Baseline Survey 26
3.3.1 Physical Environment 28
3.4 Water Resources 28
3.5 Land Resources 29
3.6 Agricultural Resources 29
3.7 Fishery Resources 29
3.8 Ecological Resources 29
3.9 Socio Economic Resources 30
3.10 Prediction of Probable Impacts 30
3.11 Potential Impact Identification 31
3.12 Potential Impact Assessment 31
3.13 Assigning Significance and Likelihood 31
3.14 Scoping 31
3.15 Bounding 32
3.16 Major Field Investigation 32
3.17 Identification of Mitigation and Enhancement Measures 32
3.18 Environmental Management Plan 32
3.19 Public Consultation 33
3.20 Environmental Monitoring Plan 33
3.21 Budget for Environmental Management Plan 33
3.22 ESIA Report Preparation 33
4. Description of the Project 35
4.1 Background of the Project 35
4.2 Major Components of the Project 37
4.3 Project Location 37
4.4 Physical Features of Substations 39
4.5 Gas Insulated Switchgear (GIS) 39
4.6 Brief Description of Proposed Substations and Bay extension Work 41
4.6.1 Khulshi SS 41
4.6.2 New-mooring SS 41
4.6.3 Bay extension work of Madhunaghat SS 41
4.7 Physical Features of the Transmission Lines 41
4.8 Construction Works 45

4.9 Construction Related works for Transmission Lines 45
4.10 Construction Related works for Substations..... 45
4.11 Phase-wise Activities of Construction Works..... 46
4.12 Construction Equipment 47
4.13 Civil Construction Works..... 47
4.14 Construction of Substation..... 47
4.15 Construction Work for Underground Cable Trenching..... 49
4.16 Civil Works for Transmission Tower 49
4.17 Electrical Works..... 51
4.18 Erection of Tower 51
4.19 Drawing of Transmission Line..... 52
4.20 Testing and Commissioning of Equipment..... 52
4.21 Grounding of Equipment..... 53
4.22 Construction Waste and Hazardous Materials Disposal..... 53
4.23 Reinstating the Site 53
4.24 Maintaining the Substation 53
4.25 Work Schedule..... 53
4.26 Estimated Cost of the Project..... 53
5. Analysis of Alternatives 55
5.1 Introduction..... 55
5.2 Alternative Analysis for Substations Upgrade/ Bay Extensions..... 55
5.3 132/33kV New Mooring Substation Upgrade to 230/132kV GIS in the Same Location 55
5.4 132/33kV Existing AIS Khulshi Substation'sStep by Step Upgrade to GIS based 230/132kV in an Adjacent Location..... 59
5.5 Alternative Transmission Line Routes..... 65
5.6 Alternative RoutesbetweenMadunaghat and Khulshi..... 65
5.7 Alternative Routes betweenAnowara and Anandabazar (New mooring) 68
5.8 Alternative Routes from Hathazari to Rampur..... 71
6. Analysis of Associated Facilities..... 73
6.1 Introduction..... 73
6.2 Anowara Power Plant..... **Error! Bookmark not defined.**
6.3 Anowara GIS Substation..... 73
6.4 Baseline..... 74

6.5 Water Availability 74
6.6 Environmental Quality 74
6.7 Noise Quality 75
6.8 Agricultural Resources 75
6.9 Ecological Resources 76
6.10 Socio-economic Resources 76
6.11 Impact 77
6.12 Air Quality 77
6.13 Water Resources 77
6.14 Agricultural Resources 77
6.15 Ecological Resources 77
6.16 Socio-Economic Resources: 78
7. Environmental and Social Baseline 79
7.1 Introduction 79
7.2 Physical Environment 79
7.3 Meteorology 79
7.4 Geology 83
7.5 Seismicity 84
7.6 Water ResourceSystem 87
7.7 Land Resources 90
7.8 Agriculture Resources 92
7.9 Cropping Pattern and Intensity 92
7.10 Crop Area and Production 93
7.11 Ecological Resources 95
7.12 Bio-ecological Zone 95
7.13 Substation wise ecological information 97
7.14 Transmission line wise ecological information 98
7.15 Ecosystem 99
7.16 Fisheries Resources 102
8. Stakeholder Consultation 103
8.1 Introduction 103
8.2 Objectives 103
8.3 Identification of Stakeholders 103
8.4 Approaches 104

8.5 Methodology 104
8.6 Schedule of Consultation Meeting 106
8.7 Identified Issues during the Period of ESIA 107
8.8 Future Consultation Plan for PGCB and Contractor 109
8.9 Participant Lists 111
9. Screening of Environmental Social Impact 113
10. Potential Environmental Impacts and Mitigation Measures 119
10.1 Environmental Impact Matrix 119
10.2 Positive Impacts 125
10.3 Impacts during pre-construction stage 126
10.4 Impacts during construction stage 126
10.5 Impacts during Post construction stage 135
11. Social Impact Assessment 139
11.1 Socio-Economic Resources 139
11.2 Administrative Bounding of the Study Area 139
11.3 Demography 140
11.4 Household Size 140
11.5 Age Structure 140
11.6 Dependency Ratio 141
11.7 Ethnic Community 141
11.8 Main Occupation 142
11.9 Housing Condition 143
11.10 Land Price 144
11.11 Income and Expenditure 144
11.12 Public Utilities 145
11.13 Cultural Resources 145
11.14 Land required for project Intervention: 145
11.15 Baseline condition of the Project Affected People: 146
11.16 Underground Transmission Line 146
11.17 Overhead Transmission Line 148
11.18 Alternative Traffic Plan: 149
11.19 Access Restrictions: 150
11.20 Impact on Livelihood 150
11.21 Impact on Land in the OHT RoW 151

11.22 Affected Residential Structures in the OHT RoW 152
11.23 Affected Commercial Structures in the OHT RoW 152
11.24 Temporary Loss of Crops in the OHT RoW 153
11.25 Loss of Trees in the OHT RoW 154
11.26 Other Impact in the OHT RoW 154
11.27 Affected Commercial Structures in the UGT RoW 154
11.28 Vulnerable Households 154
11.29 Income and Livelihood Restoration 155
11.30 Resettlement Costs and Rehabilitation Cost and Budget 155
11.31 Calculation of Estimated Costs 155
11.32 Summary of Resettlement and Rehabilitation Budget 156
11.33 Assessment of Unit Value for Compensation 158
11.34 Replacement Value of Land 158
11.35 Cost of Structures 159
11.36 Compensation for Crops 160
11.37 Compensation for Trees 160
11.38 Resettlement and Rehabilitation Assistance 161
11.39 Income and Livelihood Restoration Grant 161
12. Environmental and Social Management Plan 163
12.1 Institutional Arrangements 163
12.2 Mitigation Compensation and Enhancement Plan 165
12.3 Environmental Management Responsibilities (Contractors) duringConstruction 172
12.4 Environmental Protection Plan (Contractors) 172
12.5 Traffic Management 177
12.6 Monitoring plan 179
12.7 Monitoring Plan for Physical Environment and Water Resources 179
12.8 Monitoring plan for Land Agriculture Resources 179
12.9 Monitoring Plan for Ecological Resources 180
12.10 Monitoring Plan for Socio-Economic Resources 181
12.11 Budget for the Environmental Management Plan (EMP) 182
13. Grievance Redress Mechanism 183
13.1 Introduction 183
13.2 Objectives of Grievance Redress Mechanism 183

13.3 Guideline to Redress Grievances 183
13.4 Composition of GRC 183
Local Level GRC (LGRC) 184
Terms of Reference for Local GRC (LGRC) 184
Project-level GRC (PGRC) 185
ToR for Project Level GRC (PGRC) 185
13.5 Processes for Filing GRC Cases and Role of GRC 186
14. Conclusion and Recommendation 187
14.1 Conclusions 187
14.2 Recommendations 187
Appendix –I: Site Clearance Certificate 189
Appendix –II: A3 Layout Maps 191
Annex: Resettlement Plan Framework ..... Error! Bookmark not defined.

List of Tables

Table 2.1: Environmental and Social Standards (ESS) for AIIB 18

Table 2.2 Screening and Categorization of AIIB Projects 18

Table 2.3: Air Quality Standard Comparison 22

Table 2.4: Noise Quality Standard Comparison 23

Table 3.1: Variables and Associated Data Collection Techniques 30

Table 3.2: Assessment of Potential Impact Significance 31

Table 3.3: Criteria for Determining Likelihood of the Potential Impacts 31

Table 4.1: Interventions under the Project 37

Table 4.4: Physical Features of the New Mooring 230/132 kV Switching GIS SS40

Table 4.5: Physical Features of the Khulshi230/132/33 kV Switching GIS SS 40

Table 4.2: Physical Features of 400 kV Transmission Line 42

Table 4.3: Physical Features of Underground Cable 42

Table 4.6: Phase-wise Construction Activities 46

Table 4.7: Estimated Project Cost 54

Table 5.1: Comparative Analysis of the Substation Upgrade Plan at New Mooring 56

Environmental burden bore by the two alternatives are given below in Table 5.2. 56

Table 5.2: Comparative Analysis from the Environmental Perspective of the New Mooring Upgrade Work 56

Table 5.3: Comparative Analysis of Substation Site Selection at Khulshi 60

Table 5.4: Comparative Analysis of Substation Site Selection at New Mooring .. 61

Table 5.4: Comparative Analysis of Options for Proposed Madunaghat-Khulshi Underground Transmission Lines from Technical Perspective 65

Table 5.5: Comparative Analysis of Options for Proposed Madunaghat-Khulshi Underground Transmission Lines from Environmental Perspective 66

Comparative analysis matrix of Anowara-Anandabazar (New Mooring) are given in Table 5.6. Table 5.6: Comparative Analysis of Options for Proposed Anowara-New mooring, transmission lines from Technical Perspective 68

Table 5.7: Comparative Analysis of Options for Proposed Anowara-New mooring, transmission linesfrom Environmental Perspective 69

Table 5.9: Comparative Analysis of Options for Proposed Hathazari-Rampur LILODouble Circuit Transmission Linesfrom Technical Perspective 71

Table 5.10: Comparative Analysis of Options for Proposed Hathazari-Rampur LILO Double Circuit Transmission Lines from Environmental Perspective 71

Table 6.1: Physical Features of the Anowara 230/132/33 kV Switching GIS SS. 74

Table 6.2. Standard Value (dBA) 75

Table 6.3: Noise Level of Anowara Substation 75

Table 6.4: Amount of Land to be acquired for Substation Implementation 76

Table 7.1: Standard Value (dBA) 89

Table 7.2: Noise Level of Several Locations 89

Table 7.3: Value of Air Quality Parameters in Chattogram 90

Table 7.4: Land Use of Direct Impacted Area (DIA) Considering 20m RoW 91

Table 7.5: Land Use of Indirect Impacted Area (IIA) Considering 80m RoW (40m in Both Side of DIA) 92

Table 7.6: Land Use of Substation Area 92

Table 7.7: Cropped Area and Production in Proposed RoW 94

Table 7.8: Cropped Area and Production in Proposed Substation 94

Table 5.9: Bio-ecological Zones of the study area 95

Table 1.1: Environmental Impacts of the selected Substations (SS) subprojects. 113

Table 1.3: Environmental Impacts of the selected Overhead Transmission Line (OHT) subprojects 116

Table-: 12.2 Occupational health and safety issues during construction stage 133

Table 11.1: Administrative boundary of the Study Area and Area Coverage (In Percentage) by Union and Paurashava 139

Table 11.2: Demographic Data of the Study Area 140

Table 11.3: Availability of Labour and Wage Rate of the Study Area 142

Table 11.4: Land Price of the Study Area 144

Table 11.5: Land requirement for implementing the project 145

Table 11.6: Age structure of PAP's for underground Transmission Line 147

Table 11.7: Household size of PAP's for underground Transmission Line 147

Table 11.8: Land ownership of PAP's for underground Transmission Line 148

Table 11.9: Daily income Range of the PAP's for Underground Transmission Line 148

Table 11.10: Age structure of respondents of households throughout the Overhead Transmission Line 148

Table 11.11: Household size of PAP's for Overhead Transmission Line 149

Table 11.12 Occupational Variation of Overhead Transmission Line 149

Table 11.13: Summary of OHT interventions and their impacts 151
Source: Initial field survey for the study, 2018 151
Table 11.14 Summary of UGT interventions and their impacts 151
Table 11.15 Use of land in the OHT RoW 152
Table 11.16 Affected residential structures by type in the ROW 152
Table 11.17: Cropping pattern in the OHT RoW 153
Table 11.18: Crop production in the RoW of OHT 153
Table 11.19: Affected trees on private land by species and number 154
Table 11.20: Breakdown of cost for overhead and underground transmission line 157
Table 11.21: Average rate of land in Project area by mouza name 158
Table 11.22: Estimated amount of land compensation for the Project 159
Table 11.23: Estimated compensation amount for primary structures 160
Table 11.24: Estimated amount of compensation for standing crops 160
Table 11.25: Estimated cost of affected trees in the project area 160
Table 11.26: Estimated cost for resettlement benefits of the affected entities. 161
Table 12.1: Roles and Responsibilities for ESMP Implementation 164
Table 12.2: Environmental and Social Management Plan 166
Table 12.3 Summary Matrix for Monitoring the Activity of Contractors 173
Table 12.3: Monitoring plan for Land Agricultural Resources 179
Table 12.4: Monitoring plan for Ecological Resources 181
Table 12.5: Monitoring Plan Socio-economic Resources 181
Table 12.6: Budget for the Environmental Management Plan 182

List of Figures

Map 1.1: Base Map of the study area (Anowara–Anandabazar) 3
Map 1.2: Base Map of the study area (Madunaghat–Khushi) 4
Map 1.3: Base Map of the study area (Anandabazar–Hathazari) 5
Figure 2.1: Steps Involved in Environmental Clearance following the DoE Guidelines 21
Figure 3.1: Process followed in the ESIA study 25
Figure 3.2: Madunaghat to Khulshi T/L 26
Figure 3.3: Anowara to New-Mooring T/L 27
Figure 4.1: Proposed and Existing 400kV, 230kV and 132kV Grid Network of PGCB in Bangladesh 36
Figure 4.2: Map of Project location that covers the south-east Zone of Bangladesh 38
Figure 4.3: Map of Project location showing all the inteventions 39
Figure 4.4: Angle Tower 43
Figure 4.5: Suspension Tower 43
Figure 4.6: Insulators for transmission line 43
Figure 4.7: Drawings of 400 kV Tower 44
Figure 4.8: Typical Cross-section of Underground Cable 45
Figure 4.9: Underground Cable at the existing Khulshi Substation 45
Figure 4.10: Sand Filling 48
Figure 4.11: Pilling Work 48
Figure 4.12: Ongoing 132 kV cable trenching work at Chattogram 49
Figure 4.13: Placing steel ring bunds 50
Figure 4.14: Welding of reinforcements 50
Figure 4.15: Tower pilling work 50
Figure 4.16: Pile cap reinforcement 50
Figure 4.17: Striping the tower footing with steel 51
Figure 4.18: Providing detail reinforcements 51
Figure 4.19: Casting concrete cement into tower foundation 51
Figure 4.20: Placing tower on its foundation 51
Figure4.21: Tower erection works 52

Figure 4.22: Conductor stringing 52
Figure5.1: Current scenario of New Mooring: Option-1 55
Figure 5.2: Google Map New Mooring: Option 1 58
Figure 5.3:Khulshi Option-1 59
Figure 5.4:Khulshi Option-2 60
Figure 5.5:Khulshi:Option-3 60
Figure 5.6: Google Map showing location of the options atKhulshi 64
Figure 5.10: Base Map of Madunaghat-Khulshi 230 kV double circuit TL 67
Figure 5.11: Base Map of Anowara-New Mooring 230 kV double Circuit TL 70
Figure 5.12: Base Map of Hathazari-Rampur LILO 230 kV Double Circuit TL 72
Conclusion: Hathazari-Rampur LILO 72
Figure 6.1: Ecological view of the project area at Anowara 76
Figure7.1: Monthly variation of Rainfall at Ambagan BMD station (1984-2013). 80
Figure7.2: Monthly variation of Rainfall at Patenga BMD station (1984-2013) ... 80
Figure7.3: Monthly variation of Temperature at Ambagan BMD station(1984-2013) 81
Figure7.4: Monthly variation of Temperature at Patenga BMD station(1984-2013) 81
Figure 7.5: Monthly variation of relative Humidity at Ambagan BMD station(1984-2013) 82
Figure7.6: Monthly variation of wind speed at Ambagan BMD station (1984-2013) 82
Figure 7.7: Monthly variation of wind speed at Patenga BMD station(1984-2013) 83
Figure 7.8: Monthly variation of maximum and average sunshine hours at Patenga BMD Station (1984-2013) 83
Figure 7.9: Depth of ground water at CHI008 around the study area 87
Figure 10.1: Role of New substation T/L line strengthening National Grid 125
Figure 11.1: Household size of the Study Area ..... **Error! Bookmark not defined.**
Figure 11.2: Age Structure of the Study Area ..... **Error! Bookmark not defined.**
Figure 11.3: Dependency Ratio in the study Area ..... **Error! Bookmark not defined.**
Figure 11.4: Ethnic Population and Major Ethnic Groups 141
Figure 11.5: Literacy rate in study area ..... **Error! Bookmark not defined.**
Figure 11.6: Percentage of treatment facility in the study area **Error! Bookmark not defined.**
Figure 11.7: Employment Status in the Study Area .... **Error! Bookmark not defined.**

Figure 11.9: Occupational Status in the Study Area ... **Error! Bookmark not defined.**

Figure 11.10: Indicators of Labor Migration ..... **Error! Bookmark not defined.**

Figure 11.11: Housing Condition in the Study Area 143

Figure 11.12: Drinking Water Facility in the Study Area**Error! Bookmark not defined.**

Figure 11.13: Sanitation Facility in the Study Area..... **Error! Bookmark not defined.**

Figure 11.14: Sanitation and Drinking water Facility in study area**Error! Bookmark not defined.**

Figure 11.15: Electricity Facility in Study Area..... 144

Figure 11.16: Distribution of Household by income and Expenditure 145

Figure 11.17: Self Assessed Poverty Condition ..... **Error! Bookmark not defined.**

Figure 12.1: Organogram for Environmental and Social Management of the project 164

Figure 13.1 Grievances Redress Processes..... 186

List of Maps

Map 1.1: Base Map of the study area (Anowara–Anandabazar) 3
Map 1.2: Base Map of the study area (Madunaghat–Khushi) 4
Map 1.3: Base Map of the study area (Anandabazar–Hathazari) 5
Map 3.2: Madunaghat to Khulshi T/L 26
Map 3.3: Anowara to New-Mooring T/L 27
Map 7.1: Earthquake zoning map with seismic coefficients of the study area 85
Map 7.2: Different geological faults of Bangladesh and the study area 86
Map 7.3: Bio-Ecological Zone of the study area 96

Abbreviations and Acronyms

AEZ	Agro-ecological Zone
AIIB	Asian Infrastructure and Investment Bank
AIS	Air Insulated Switchgear
AP	Angle Point
ASA	Association for Social Advancement
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BEZA	Bangladesh Economic Zones Authority
BEZ	Bio-ecological Zone
BMD	Bangladesh Meteorological Department
BNH	Bangladesh National Herbarium
BPDB	Bangladesh Power Development Board
BWDB	Bangladesh Water Development Board
CCL	Cash Compensation under Law
CEGIS	Center for Environmental and Geographic Information Services
CP	Control Panel
DAE	Department of Agricultural Extension
DC	Deputy Commissioner
DC	Double Circuit
DG	Director General
DIA	Direct Impact Area
DoE	Department of Environment
DoF	Department of Fisheries
DPP	Development of Project Proforma
DS	Disconnected Switch
EC	Electrical Conductivity
ECA	Environment Conservation Act
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering, Procurement & Environment
ERP	Emergency Response Plan
ES	Earthing Switch
ESF	Environmental and Social Framework
ESMP	Environmental and Social Management Plan
ESMPF	Environmental and Social Management Planning Framework

ESS	Environmental and Social Standards
EQS	Environment Quality Standards
FGD	Focused Group Discussion
FS	Feasibility Study
FY	Fiscal Year
GIA	General Impact Area
GIS	Geographic Information Services
GIS	Gas Insulated Switchgear
GO	Government Organization
GoB	Government of Bangladesh
HSE	Health Safety and Environment
HYV	High Yielding Variety
IEC	Important Environnemental Component
IEE	Initial Environnemental Examination
IESC	Important Environnemental and Social Component
IFC	International Finance Corporation
ILO	International Labour Organisation
IUCN	International Union for Conservation for Nature
KAFCO	Karnaphuli Fertilizer Company Limited
KII	Key Informant Interview
kg.	Kilogram
Km	Kilometer
KMZ	Keyhole Marked up Zipped
kV	kilo Volt
LA	Lightning Arrester
LILO	Line In Line Out
LGED	Local Government Engineering Department
LNG	Liquefied natural gas
mm	millimeter
MoEF	Ministry of Environment and Forest
MoU	Memorandum of Understanding
MW	Mega Watt
MVA	Mega Volt Ampere
NCA	Net Cultivated Area
NEMAP	National Environnemental Management Action Plan
NEP	National Energy Policy
NGO	Non-Governmental Organization
NoC	No Objection Certificate

NWRD	National Water Resource Database
OCR	Ordinary Capital Resources
O/H	Overhead
OP	Operational Policies
PAPs	Project Affected People (s)
PCM	People's Consultation Meeting
PGCB	Power Grid Company of Bangladesh Limited
PP	Power Plant
PPE	Personal Protection Equipment
PRA	Participatory Rural Appraisal
PSMP	Power System Master Plan
PVC	Polyvinyl Chloride
PWD	Public Works Department
RCC	Reinforced Cement Concrete
REB	Rural Electrification Board
RoW	Right of Way
RP	Resettlement Plan
RP	Relay Panel
RRA	Rapid Rural Appraisal
RS	Remote Sensing
SAS	Substation Automation System
SPM	Suspended Particulate Matter
SSs	Sub stations
STW	Shallow Tube Well
ToC	Table of Content
ToR	Terms of Reference
TLs	Transmission Lines
U/G	Under Ground
USD	United Sates Dollar
WARPO	Water Resources Planning Organization
WHO	World Health Organization
WB	World Bank

Executive Summary

Despite massive development of power system in Bangladesh, there are still many challenges thatneed to be addressed so thatthepowersystemcan provideanefficient electricityserviceinBangladesh.Inline,theproposed–a)230/132kVGas InsulatedSwitchgear(GIS) substationatNewMooring,b)230/132kVGIS substationatKhulshi, (existingAirInsulatedSwitchgear(AIS)based132/33KVsubstation willbedismantledandupgraded to 230/132 kV GIS)c)25.182kmlong400kV transmissionline(19.932kmoverheadand5.25kmunderground)betweenAnowaraandAnandabazar(NewMooring),d)2.66kmlong 230 kVline-in-line-out (LILO)doublecircuitundergroundtransmissionline from HathazaritoRampur,e)a14.56 kmlong230kV underground transmissionlinefromMadunaghat to Khulshiand f) two230kV GISbays extension works atMadunaghat SubstationinChattogramDivisionalareawillhelpto establishtransmissioninfrastructuresandevacuationofbulkelectricitygenerated from upcomingpowerplantstomajorloadcenters.Thisproposedproject,thus,willhelptomeet up therapidlygrowing demandsfor electricityofresidential, commercial and industrial consumersin Chattogramcityandadjacent areas.

For the project, the project authority (PGCB) has already received necessary clearance from the Department of Environment (DoE), for which an Initial Environmental Examination (IEE) was submitted. However, this Environmental and Social Impact Assessment (ESIA) report is prepared according to the requirement of the co-financier (AIIB). In doing so, guideline on environmental and social framework of AIIB is followed. The report also includes review of several relevant legislations and policies exist in Bangladesh.

The information about the project for accomplishing the ESIA was collected by a multi-disciplinary ESIA Team for gaining an empirical understanding of the proposed interventions and their possible social-environmental consequences. .

The study team made a number of field visits to the proposed interventions and collected primary data on environmental and social components using different techniques of RRA, formal and informal interview along with group discussion and public consultations. During the field visits, the multi-disciplinary ESIA team members made professional observations pertaining to their individual areas of expertise. During the ESIA study, nine (9) consultation sessions were held with the respective stakeholders and their feedbacks have been addressed in this report. Here, respective stakeholders include both (i) primary such as affected persons including small business community, shopkeepers, pedestrians, students, women group, etc.; and (ii) representatives from City Corporation, respective Union *Parishad*, KGDCL, CWASA, BTCL, civil society representatives, NGOs, etc. In the consultation process, the concerned stakeholders were mapped out, informed the consultation places, discussed the issues with them, received and recorded their feedback and incorporated into the report. Besides, a future consultation plan is also incorporated in this report for the stages of (i) pre construction, and (ii) during construction.

Alternatives in environmental studies for the substations (New Mooring, Khulshi) sites are analyzed and compared in terms of 'No Action' option with the proposed 'Action Option(s)'. No action option defines the scenario of the present situation. Action Options include project interventions and are compared based on the following two criteria: a) Physical and economic aspects of the alternatives, and b) impact on the environment. Under physical

and economic aspects – type and location of the land, land availability and complexity of acquisition, RAP requirement, scope of expansion in the future road condition, land development requirement, growth of power sector, implementation expense etc. are compared. Under environmental aspects, impact on air, water, soil and noise are considered. These two criteria are then used to reach a conclusive recommendation for sites selection for substation works as part of this Project. The New Mooring site has only one 'action option' and it has been selected over the 'no action' alternative because the action option has many positive socio-economic implications. As for the Khushi site, the location inside the boundary of the existing 132kV PGCB station will not require any complexity of land acquisition compared to two other action options. Moreover, the socio-economic long-term benefits outweigh the short-term environmental bearings. Therefore, this 'action option' has been given the priority over the 'no action' alternative.

For Transmission Line development [Madunaghat-Khulshi, Anowara-Anandabazar (New Mooring) and Hathazari to Rampur], again two criteria are used including 'No action' option: a) Physical and economic aspects of the alternatives are compared considering the length, difficulty of implementation, location of existing structures, number of tower requirements, meeting demand, power growth, expenses etc., b) Environmental factors such as river crossing, erosion, reserve forest, ecologically critical area (ECA), bird habitats, etc. are used for comparison. Based on comparing these two criteria, conclusive recommendations are given for the transmission line expansion plan under this Project. For Madunghat-Khulshi route, the route with the least difficulty in trenching and excavation works, based on the field survey, is considered over the other two routes as it will require the less expenditure in construction activities. At the same time, the selected option will bolster the power system network in the Chattogram region, bringing in socio-economic long-term benefits. As a result, this is considered over the 'no action' alternative. The Anowara-Anandabazar route, the route with the least impact on settlements, based on the field survey, is considered as the best 'action' option out of three alternatives. Implementation of this line under this project will play a significant role to bring the Chattogram region under a reliable power system – encouraging growth of the economy of the area and hence is considered as the way forward instead of the 'no action' alternative. Finally, the Hathazari to Rampur route has only one feasible route and it has also been compared to the 'no action' option. This action option will also significantly improve the power network of Chattogram, bringing about great socio-economic benefits and hence is selected over the 'no action' option.

Anowarasubstationisnot undertheproject components,butitislinkedtoAnowaratoNewMooring400 kVdoublecircuitline. Anowara230/132/33kV GISsubstationwillneed20acresoflandandproposedlocationis completely agriculturalland.Mostoftheagriculturallandis three croppedland.Cropping intensityofproposedlandareais250%andtotal70tonsriceisproducedinthisland annually.

For the tower footing of the overhead Transmission Line, 1.53 acres of land is required; whereas, no land is required for underground Transmission Line, as this TL will be constructed under the ground of the road side. On the other hand, required land acquisition and development for construction of the 230/132 kV GIS substation at New Mooring will be carried out under another project funded by the World Bank. However, no land is required for substation proposed to be upgrated at Khulshi, as this substation will be constructed at the existing location. Similarly, no land is required for Bay extension at Madunaghat Substation, as this will also be constructed at the existing substation. Currently, the required land proposed above has no human settlement, eventually no displacement will take place for the land use. Therefore, no resettlement/Resettlement Action Plan (RAP) is needed for this

project. Compensation for required land of 56 overhead towers will be provided. For underground transmission line construction, the 565 affected owners of business structures (258 permanent and 307 temporary shops) will be paid compensation equal to 14-days profit margin. Here, 14 days are considered based on tentative duration of the construction period of the underground transmission line. The overall estimated budget for compensation under this Project is 3.74 million USD. A Resettlement Planning Framework, however, is prepared as a part of this ESIA study.

The physical environment of the study area is assessed in terms of meteorology, seismicity, environmental quality, and natural disaster. The record of last 30 years (1984-2013) of Ambagan station shows that the maximum of 846 mm rainfall occurred in June 1984, and the maximum temperature varies from 28°C to 34°C. The monthly average of last 30 years data (1984-2013) of Ambagan station shows that April is the warmest month and January is the coldest month. Relative Humidity varies seasonally from minimum of 67% in February to maximum of 87% in July. Maximum wind speed of Ambagan station varies from 30 to 130 km/day in a year and the maximum wind speed occurs in the month of April. The Chattogram District area falls under the Zone II, the Zone-II comprising the central part of Bangladesh consists of the regions of recent uplifted Pleistocene blocks of the Barind and Madhupur and the western extension of the folded belt with the Bask seismic co-efficient of 0.05g.

Overhead portion of AnowaratoNew Mooring(Anandabazar)Transmission Line willcrossovernumbersofmajorand branch khals (canals) and river. The major khals are Char Lakkhakhal, Shikalbaha/Murarikhal, Karnafuli canal and Mahesh khal. The line will also cross over the Karnafuli River near the Chattogram Port where the river width is about 700 meter. The river and khals have tidal influences. Another transmission line from Khulshi to Madhunaghat Substation will be underground along with the Dhaka-Chattogram Highway, CDA Avenue, Chattogram-Cox's Bazar Highway and Chattogram-Rangunia-Kaptai Road and cross beneath the Chandgaonkhal and Burircharkhal. The Madhunaghat Substation is located besides the Halda River.

The depth of groundwater from the ground surface in dry season goes downward and depth is highest in April at CHI008 station. On the other hand, water table rises in monsoon and the lowest depth is observed in August due to recharge by rain water. The New Mooring Substation site situated beside the sea. It is to be mentioned here that the substation will not be hampered during cyclone or tidal flooding as there is elevated and wide road namely Chattogram Coastal road will act as embankment and having bank protective work along with the road that will protect the area from any natural disaster. On the other hand underground transmission line will cross through city area and which is outreach from flooding area. The proposed project site Khulshi Substation, Madunaghat Substation and proposed New Mooring Substation and the Transmission tower are not situated in or beside any hilly area, as such the Project will never be affected by the landslide.

The Right-of-Way (RoW) of proposed overhead Transmission Line from Anowara to Patiya Upazila will pass over the agriculture land and most of the tower will be constructed on agriculture land. The cropping intensity of the study area is about 162%. The New Mooring Substation is double cropped and the cropping intensity of this area is about 200%.

The proposed project locations are not located in ecologically critical area and proposed Transmission Line will not be obstructed for bird flying zone. Minor terrestrial vegetation would be damaged or cleared out especially in the RoW and partially in the GIA (General Impact Area) as well as in substation sites. In this case, herbs and shrubs in some locations

are anticipated to be damaged. Transmission Line in the urban area is proposed to be underground. No vegetation damage will occur in the urban area. Grid maintenance may impede augmentation of trees to the peripheries of the Project. The impacts on biological components are found to be negligible. There may be some habitat loss of tiny wildlife, especially tiny birds, amphibians and reptiles due to implementation of substations, towers and stringing transmission lines.

Demographic and socio-economic conditions of the Project area was studied in terms of households number, dependency ratio, household size, sex-ratio, age structure, ethnic community, literacy rate, access to health facilities, employment opportunity, occupational patterns, labor wage rate, migration, housing condition, drinking water, sanitation facility, electricity facility, land price, poverty condition, etc. The examinations reveal that the Project area on the whole stands at favorable stage compared to the rest of the country and therefore Project interventions would not cause any adverse socio-economic or demographic tribulations.

Screening of environmental and social impact indicates subproject specific impacts of the project. In pre-construction phase, land acquisition needs to address for tower footing locations. For substation impact on soil quality, loss of crop air and noise will be impacted during construction phase. For underground substation traffic congestion, public utility environmental pollution will be impacted due to construction activity and for overhead transmission line community health and safety, and loss of crop production is the major one. The proposed work, thus, may cause minor air pollution from fuel combustion (light fuel oil) by vehicles used for supplying cables and equipment. These may in turn impact ambient air quality. Further deterioration of ambient air quality of the locality might occur due to land filling, foundation, RCC woks at substation sites. During construction phase, mobilization and operation of equipment and machineries will generate noise in different locations of the study area. Construction wastes such as sand, cement, stone, brick chips, brick etc. at substation site may create hazard to the surroundings. Traffic jam and drainage congestion may arise in the city area due to construction of underground transmission lines. Vegetation under the transmission line may be impacted due to trimming or cutting of branches/trees for maintenance work. The flying mammals (Indian Flying Fox) might be caught/electrocution with wire during their movement, which can be mitigated through the use of insulated cables.

However, alongside some negative impacts as mentioned above, there would be significant beneficial impacts in terms of employment creation, expansion of business and industries and smooth flow of electricity to the entire neighborhood. There would be favorable impact on land prices due to overall improvement of the project area. Uninterrupted power supply would improve the productivity, which would positively affect the national growth and development. In this regard, national and regional development would be ensured after completion of the work.

Mitigation measures are suggested for each of the environmental impacts. Some of these mitigation measures will include, but not limited to preparing working schedule carefully so that damage to crops would be minimum, building awareness of the farmers for carrying out necessary crop production and intercultural operation in the tower locations, spraying of water on road and materials stockyards carrying materials at night, erecting temporary fencing at construction sites and, identification of potential exposure levels in the workplace. An Environmental and Social Management Plan (ESMP) and monitoring plan also developed that cost 173 lakh BDT.

The Project implementation will be led by the Project Implementation Unit (PIU) that will be established within PGCB. The PIU will be headed by the Project Director (PD). An

Environment and Social Unit (ESU) will be established under the PIU and recruitment of qualified environmental and social staffs are underway. This ESU will assist the PIU on issues related to environmental and social management and oversee the Construction Supervision Consultant (CSC) and contractors and will compile quarterly mitigation and monitoring reports on ESMP compliance, to be sent to the Project Director and also shared with the AIIB, throughout the construction period.

The Project Proponent would establish a procedure to deal with and resolve any queries as well as address complaints and grievances about any irregularities. In this regard, a policy and/or guideline will be prepared and adopted for assessing and mitigating potential social and environmental complaints/impacts through GRM. The Grievance Redress Committee (GRC) will be established locally at Project sites and centrally at the Project level to receive as well as settle grievances from the affected persons and other local stakeholders. The two-tier GRM will be-composed of local GRCs at the union/municipal level (LGRC), the first tier, and Project GRC at the central level (PGRC), the second-tier. Most of the grievances will be resolved at the local-level GRC, but those cases that cannot be resolved at the local level will be forwarded to PGRC. The LGRC will be constituted with representation of the local UP Chairman and affected people ensuring women's representation.

For implementing the Environmental and Social Management Plan (ESMP) and monitoring the proposed Project, around BDT 173 Lakh will be required. The proposed monitoring cost is 78 Lakh for four years. The major cost would be involved in crop compensation, soil quality reestablishment, tree plantation and social security, especially for contingency fund due to emergency meet up, during construction period of towers and substations. The project implementation should be carried out under the overall supervision of the Project Director. Considering all impacts and proposed ESMP measures, through this report, it is recommended that environmental clearance may be issued for the proposed project considering the power security of the country.

1. Introduction

1.1 Background of the Study

Power Grid Company of Bangladesh Limited (PGCB) intends to construct, renovate and augment the substations and transmission lines with a project titled "Expansion and Strengthening Power System Network under Chattogram Area". The proposed 400 kV double circuits TL from Anowara to New Mooring and 230 kV double circuit underground cable from Madunaghat to Khulshi and 230 kV LILO of Hathazari-Rampur in Chattogram division area will help establish transmission infrastructure and evacuation of bulk electricity generated from upcoming power plants at Anowara, Matarbari to major load centers. This will help to meet up the rapidly growing demands of residential, commercial and industrial consumers in Chattogram city and adjacent areas. Proposed 230/132/33 kV GIS substation at Anowara is connected to Anowara to New-Mooring 400 kV double circuit line and another 230/132 kV GIS substation at New Mooring.

The New Mooring substation is in turn connected with the LILO of Hathazari to Rampur and Bay extension for 230/132/33 kV GIS substation at Khulshi. Total 42.402 km (overhead and underground) transmission line and a new substation at New Mooring will be constructed. Furthermore, a substation will be upgraded at khulshi within existing substation location under this project. Power Grid Company of Bangladesh (PGCB), Government of Bangladesh (GoB) will provide fund for this project and some donor agencies such as Asian Infrastructure and Investment Bank (AIIB) has shown interest to co-finance this project if required. In this context, this Environmental and Social Impact Assessment (ESIA) report is prepared to fulfill the demand of co-financers requirement this is mandatory for loan clearance from Asian Infrastructure and Investment Bank (AIIB) and this report is prepared according to the guideline of AIIB.

Besides, according to the Environment Conservation Act, 1995 and Environment Conservation Rules, 1997, amended on ECR, 2017, all transmission lines and substations fall under 'Orange B Category' project. Projects under this category shall require an Initial Environmental Examination (IEE) to obtain Site Clearance Certificate (SSC) from the Department of Environment (DoE). The site clearance certificate from the DoE has been received on 04/03/2018 vide the office *Memo No: 22.02. 0000. 018. 72. 29. 18. 110.* Note that, due to contractual obligation (as because the contract was done before amended of ECR, 2017). CEGIS has also submitted the Environmental Impact Assessment (EIA) report to PGCB.

1.2 Objective of ESIA Study

Although the preject requires EIA and IEE reports according to the guidelines of the Department of Envrionemnt (DoE) (which have already been carried out), this ESIA report has been prepared following the demand and guidelines of AIIB. The main objectives of this ESIA study encompasss:

- Identifying the current environmental and social baseline of the area;
- Identifying important environmental and social components which may be impacted by the project;

- Assessing the potential environmental impacts, including any residual impact of the proposed project;
- Identifying mitigation measures to minimize the adverse impact;
- Preparing initial Environmental and Social Management Plan (ESMP) and
- Preparing an Environmental Monitoring Plan.

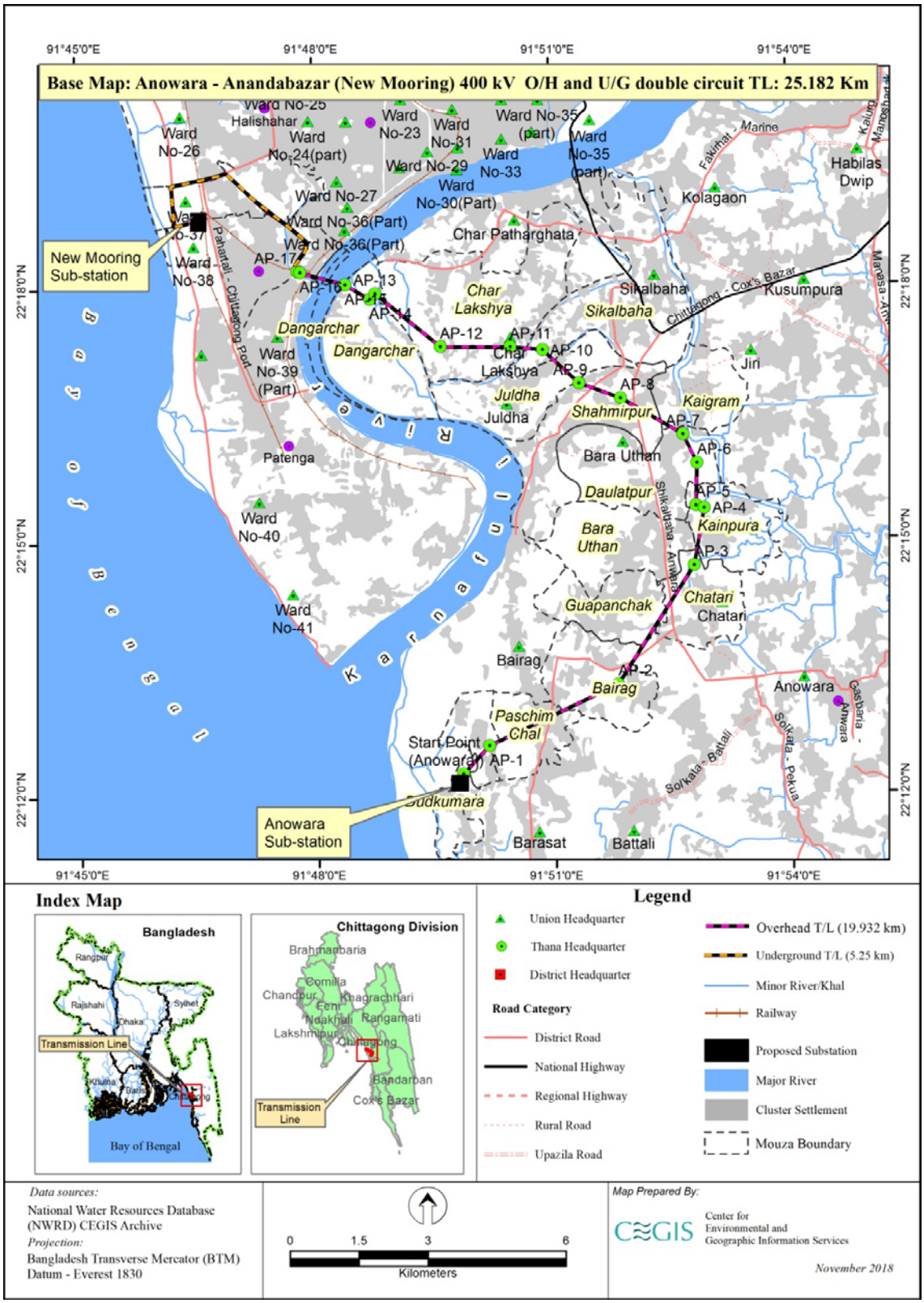
1.3 **Scope of ESIA Study**

Scope of works of the ESIA study of "Grid Network Development Project at Southern Zone" project is as follows:

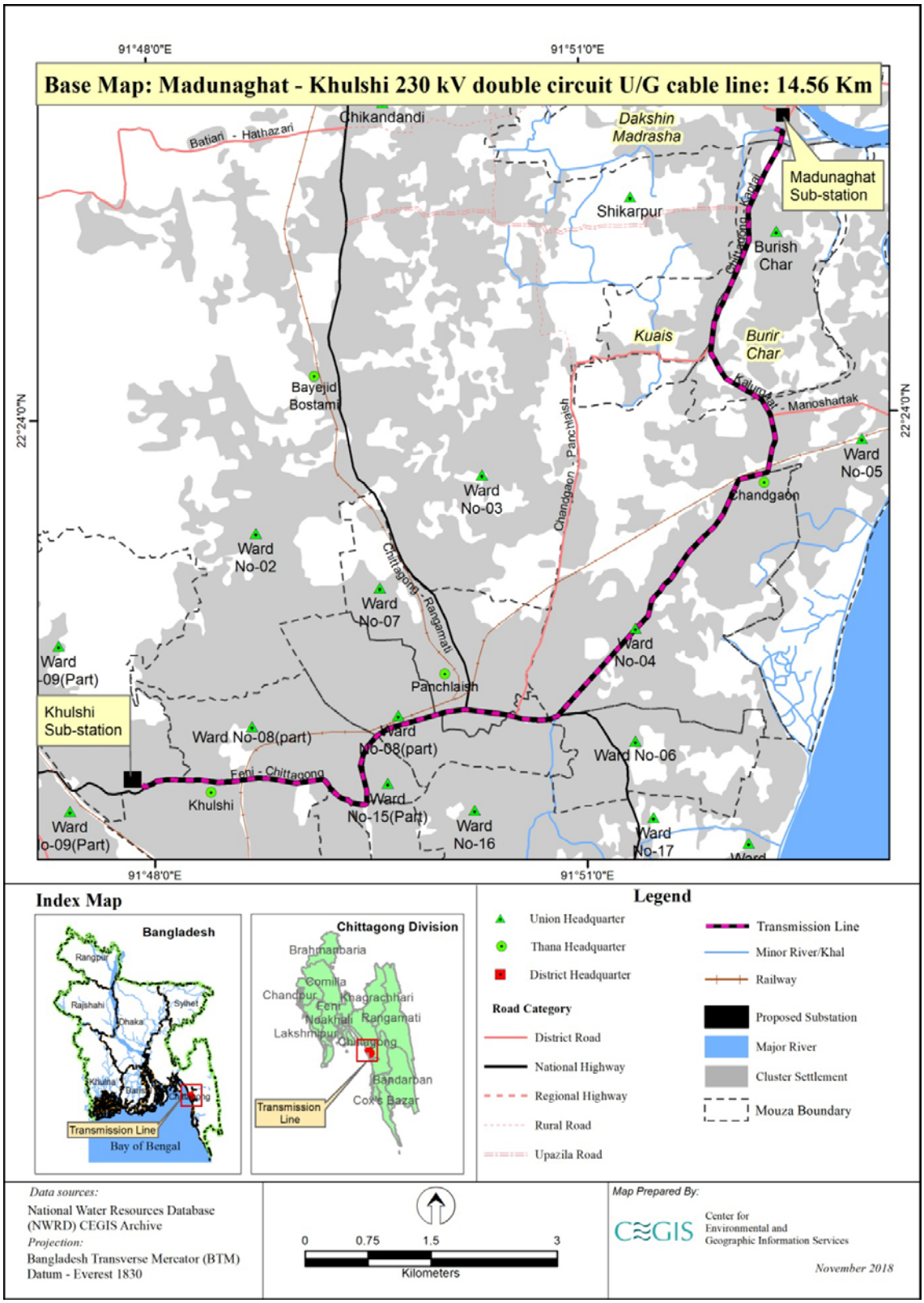
- Obtain detailed information on the proposed interventions from the feasibility report/ finally selected transmission route including the locations of the substations from the route survey team/ Client;
- Review relevant policy and legislation likely to be triggered by the project;
- Collect baseline and historical data on environmental and social components from both secondary and primary sources;
- Establish the current environmental and social baseline condition of the ESIA study area;
- Identify important environmental and social components which may be impacted by the project;
- Assess the potential impacts of the proposed interventions on the environmental and social components in the pre-construction, construction and post-construction phases;
- Prepare an Environmental and Social Management Plan (ESMP) suggesting mitigation measures for negative impacts, enhancement measures for positive impacts, compensation plan for negative impacts which cannot be mitigated and environmental and social monitoring plan and
- Prepare an ESIA report following the ToR of ESIA study approved by the DoE.

1.4 **Study Area**

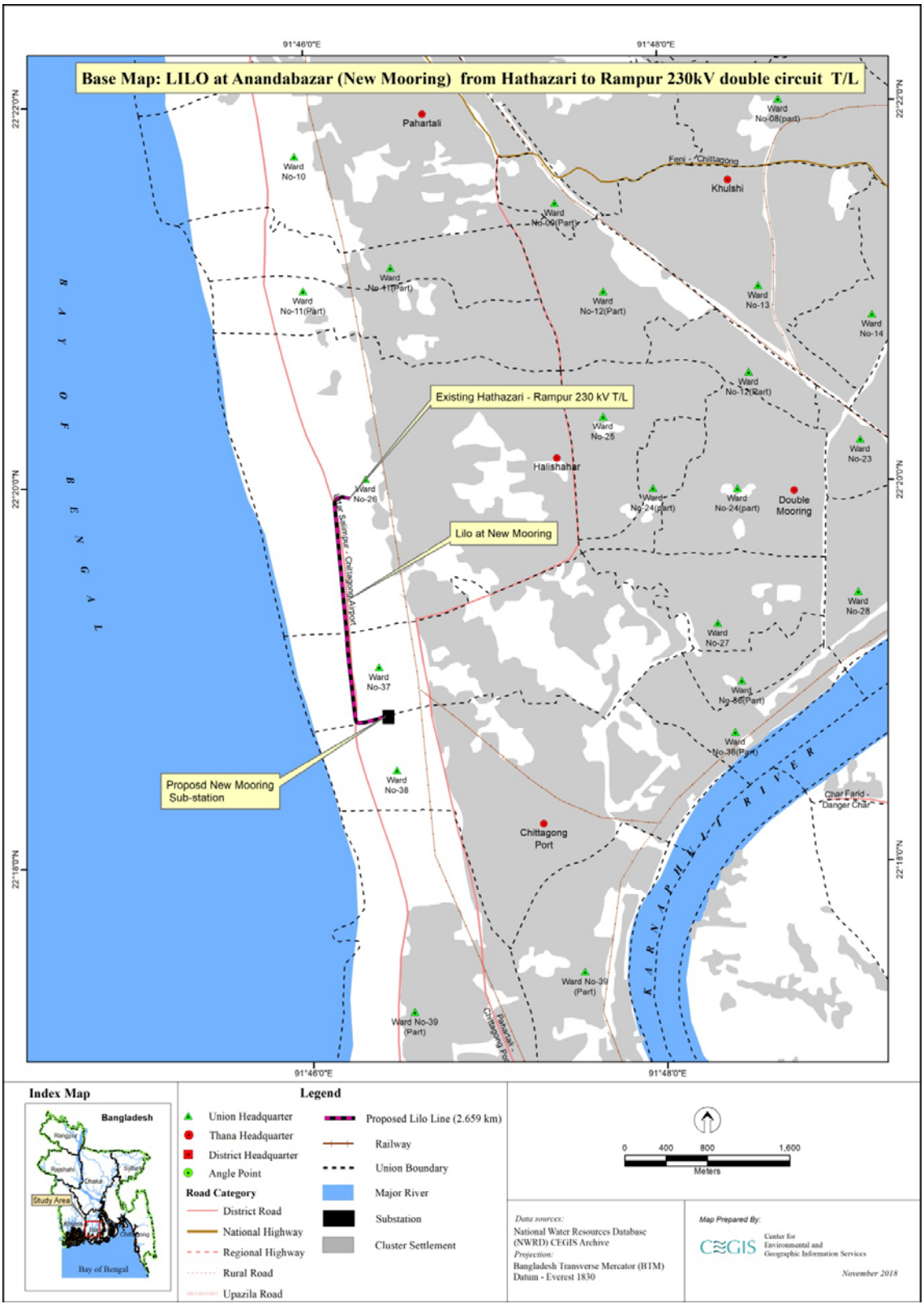
The locations of the proposed project in Chattogram divisions within Bangladesh are shown in maps. The proposed transmission lines are 400kV, 230kV and 132kV which include around 46 Km (Overhead- 20, Underground-26 and 3 nos. of substations with different specifications. The ESIA study team made visits along the route of 46 Km overhead and underground transmission line and the proposed substations locations. The following **Maps 1.1** through **1.3**show the locations of the proposed Transmission line and Substations of the Power Grid Network Strengthening Project. A3 size maps are attached in **Appendix-II**.



Map 1.1: Base Map of the study area (Anowara–Anandabazar)



Map 1.2: Base Map of the study area (Madunaghat–Khushi)



Map 1.3: Base Map of the study area (Anandabazar–Hathazari)

1.5 **ESIA Study Team**

The ESIA team of the proposed project comprised of the following professionals:

Mr. Mujibul Huq, Environmental Planner, ESIA Study Team Leader

Mr. Jalal Ahmed Chaudhury, Electrical Engineer, Advisor, ESIA Team

Dr. Dilruba Ahmed, Sociologist

Mr. Md. Sarfaraz Wahed, Water Resource Expert

Mr. Md. Ebrahim Akanda, Agricultural expert

Mr. Subrata Kumar Mondal, Socio-Economist

Mr. Ashoke Kumar Das, Ecologist

Mr. Md. Firoj Alam, GIS Specialist

Mr. Abid Kamal, GIS Specialist

Mr. Md. Mobasher Bin Ansari, Anthropologist

Mr. Mohammad Kamruzzaman, Ecologist

Mr. Md. Shakil Ahmed, Civil Engineer

Mr. Md. Zahid Hossain Dhali, Soil and Agricultural

Ms. Suriya Nasrin, Fisheries Biologist

A group of field workers from different discipline helped the EIA team by collecting data and gathering information from the field.

Mr. Md. Shakil Ahmed, Water Resource Engineer

Mr. Abdul Kadir, Water Resource Engineer

Mr. Md. Nazmul Kabir, Water Resource Engineer

Ms. Engr. Bilkish Sultana, Electrical Engineer

Dr. Abdul Halim Farhad Sikder, Agronomist

Mr. Md. Ashraful Alom, Fisheries Biologist

Mr. Mohammad Kamruzzaman, Ecologist

Mr. Tanvir Ahmad Rifat, Sociologist

1.6 **Study Timeline**

The proposed study time line was very limited. It is a priority project of the government. As all know it, the power related projects have given more importance for implementation to quick elimination ofpower crisis from Bangladesh. Upcoming power from different power plants will be transmitted to national grid. Hence, within December, 2018the ESIA and related studies will have to be completed.

1.7 **Structure of the Report**

The report has been structured in compliance with the requirement of the TOR.

Chapter 1: Introduction:The introduction chapter presents a brief overview of the assignment along with its background, objectives, scope of work etc.

Chapter 2: Policy and Legislation: This chapter outlines the Policy and Legislation on environmental issues.

Chapter 3: Approach and methodology: Overall approach and methodology to collect data in different locations has been described in this chapter.

Chapter 4: Project Description: Describes the proposed interventions including alternative options suggested by the project, background, project category, need for the project, location, size and magnitude of operation in this chapter.

Chapter 5: Analysis of Alternatives: This chapter outlines the alternative analysis of the project component.

Chapter 6: Analysis of Associated Facilities. This chapter outlines the associated facilities (AF) identified for this Project.

Chapter 7: Description of Environmental and Social Baseline: Chapter five presents a description of the environmental baseline condition (physical, meteorological, agricultural and biological) as well as social baseline condition (population, demographic, settlement, housing, traffic and transports, public utilities economy and employments) of the project area.

Chapter 8: Stakeholder Consultation: This chapter mainly describes the public opinion about the project area like major problems, impacts and probable solutions and recommendation.

Chapter 9: Screening of Environmental Social Impact: This Chapter indicates subproject specific impact assessment in brief table.

Chapter 10: Potential Environmental Impacts and Mitigation Measures: This chapter briefs detail outline of the impact due to project intervention along with the mitigation measures.

Chapter 11: Social Impact Assessment: This Chapter consists of the social baseline of the study area and the affected persons. Apart from this social impacts and mitigation or compensation measures due to project intervention is the heart of this chapter.

Chapter 12: Environmental and Social Management Plan: This chapter indicates the institutional arrangements for Environmental and Social Management during construction and post construction period.

Chapter 13: Grievance Redress Mechanism: This chapter focuses on grievances and how these will be mitigated in a systematic process.

Chapter 15: Conclusions and Recommendations: The chapter mainly deals with the Conclusions and Recommendations of the study.

2. Legislative and Administrative Framework

2.1 Overview

There are several environmental policies and legislations which have direct and indirect relevance for the proposed project, particularly, the Environment Conservation Act (ECA), 1995 (amended in 2010) and the Environment Conservation Rules (ECR), 1997 (amended in December 2017). The Department of Environment (DoE), under the Ministry of Environment and Forest, Government of the People's Republic of Bangladesh, is responsible for ensuring application of environmental laws and issuance of necessary clearances.

This report is prepared considering several legislation and policies which have relevance to power transmission activity in Bangladesh. Apart from national laws and policies, Asian Infrastructure Investment Bank's (AIIB) Environmental and Social Framework is also followed because the project is funded by AIIB. All of these regulations are aimed at the conservation and protection of the environment and an overview of these legislation and policies are presented in this chapter.

The ECR, 1997 (Amendment 2017) assigns activities of power network development projects into the Orange-B category (see subsection 2.2.3). Orange B category projects require submission of an Initial Environmental Examination (IEE) report along with an Environmental Management Plan (EMP) for site clearance certificate (SCC) and environmental clearance certificate (ECC) from the DoE. However, when this project was initiated, it fell under Red Category which required a full IEE and subsequently, an EIA (Environmental Impact Assessment) for SCC and ECC.

The administrative procedures and checklist of necessary documents are also discussed in this chapter.

2.2 National Legislations

Environment Conservation Act, 1995 (amendment 2010)

The main objectives of ECA, 1995 are – conservation of the natural environment, improvement of environmental standards, and control and mitigation of environmental pollution. The main strategies of the Act can be summarized as:

- Declaration of ecologically critical areas, and restriction on the operation and process, which can be carried out or cannot be initiated in the ecologically critical areas.
- Regulation in respect of vehicles emitting smoke harmful for the environment.
- Environmental clearance.
- Regulation of the industries and other development activities – discharge permit.
- Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes.
- Promulgation of standard limit for discharging and emitting waste.
- Formulation and declaration of environmental guidelines.

Failure to comply with any part of the Environment Conservation Act 1995 may result in punishment to a maximum of 5 years imprisonment or a maximum fine of Tk. 100,000, or both.

Environment Conservation Rules, 1997 (amendments in 2002, 2003, 2017)

A set of the relevant rules have been promulgated to implement the ECA. There have been four amendments to the Rules until now in February and August 2002, April 2003 and December 2017 respectively. The Rules mainly consist of:

- The national Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of pollution activities of the existing or proposed industries/development projects/activities.
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities; and
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life;

2.3 Categorization of Projects or Industrial Units

The Rules incorporate 'inclusion lists' of projects requiring varying degrees of environmental investigation. Projects are screened as Green, Orange-A, Orange-B and Red based on their location, type and environmental burden. A list of industries is given in the Rules under each of the category which aid the proponent on choosing the correct administrative procedures. Brief description of each category is below:

Green projects are those with positive environmental impacts or negligible negative impacts such as plantation and nursery. Clearance for these is obtained on the basis of project description, initial screening and No Objection Certificate (NOC) by the local authority.

Orange A projects are those with minor and mostly temporary environmental impacts for which there are standard mitigation measures, such as the installation of tube-wells, pond sand filter (PSF), tank/reservoir, sanitary latrines etc. Application for DoE's environmental clearance requires general information, a feasibility report, a process flow diagram and schematic diagrams of facilities, environmental screening form, NOC from local authority.

Orange B projects are those which may cause moderately significant environmental impacts for which mitigation measures are easily identified, such as construction/re-construction of earthen roads, culverts, community center, office building for general services, re-excavation of canal, repairing embankment, school field etc. These require ECC from the DoE, for which an IEE with an EMP along with the information and papers specified for Orange A Category projects are needed.

Red projects are those which may cause significant adverse environmental impacts such as the construction of bridges, industrial factories, flood shelters, embankments, water control structures, power plants etc. Red categorized projects require an IEE report to obtain an SCC, and subsequently a full EIA report for ECC, along with the information required for all other categories.

Environmental Quality Standards in operation in Bangladesh are also promulgated under the ECR, 1997. There are standards prescribed for varying water sources, ambient air, noise, industrial effluents and discharges, vehicular emissions etc.

The Bangladesh standards intend to impose restrictions on the volume and concentrations of waste-water/ solid waste/ gaseous emissions etc. discharged into the environment. In addition, a number of surrogate pollution parameters like Biochemical Oxygen Demand, or Chemical Oxygen Demand; Total Suspended Solids etc. are specified in terms of concentration and/or total allowable quality discharged in case of waste-water/solid waste. Additionally, specific parameters depending on the manufacturing process are specified such as phenol, cyanide, copper, zinc, chromium etc. Air emission quality standards refer mostly to concentration of mass emission of various types of particulate, sulphur dioxide, and oxides of nitrogen and in some cases volatile organic compounds and other substances.

The Bangladesh standards, in general, are less stringent compared to the developed countries. This is in view to promote and encourage industrialization in the country. The Bangladesh standards are not for any specific period of time. There is no provision for partial compliance, too.

Environment Court Act, 2010

The Environment Court Act, 2010 is the mechanism for the establishment of environment courts and matters incidental to environmental pollution and incidental matters. The environment court enjoys the exclusive jurisdiction for trial of an offence or for compensation falling under the ECA, 1995 (amended 2010). This Act allows government to take necessary legal action against any parties who create environmental hazards or cause damage to environmentally sensitive areas as well as to human society.

According to this Act, government can take legal actions if any environmental problem occurs due to this proposed power system improvement project interventions.

The Electricity Act, 2018

The Electricity Act, 2018 repeals the previous laws relating to the supply and use of electrical energy, which was first enacted in 1910. The Electricity Act, 2018 provides clear guidelines for energy supply, electricity generation, transmission and distribution including protective and safety clauses. Under this Act, any 'Person' may obtain license to supply electrical energy and/ or lay down or place electric supply lines over or under land (Section 13 – Right of Way) or by acquiring land (Section 14 – Land Acquisition) for the conveyance of electrical energy. For such, the Licensee shall give considerable amount of time and written notification to owners along the RoW (Section 13) or acquire the land following land acquisition laws (Section 14) from the land owners.

As per the provision of this Act, the Licensee shall have the following responsibilities/ obligations:

- The Licensee shall obtain permission from appropriate personnel or authorities to open and break up the soil and/ or pavement of any or part of road, street, railway, tramway, etc. to lay down any line on either side of, underneath or above the aforementioned facilities; the same shall apply in case of laying of line on either side of, submerged in, inside of or above canals, tunnels and/or waterways or do other works following appropriate procedures as stated in Section 6 of this Act;

- The Licensee shall take prior 'Permissions' from the respective authorities in case of works near other utility services (such as gas, water, sewerage, etc.) as well as providing 'Notice' of commencement of work bar emergency situation as stated in Section 8 of this Act;
- The Licensee shall be responsible for any repair-works of road, street, pavement, sewerage, etc., including refilling of excavated soil and disposal of generated waste as a direct result of their interventions as stated in Section 9 of this Act;
- The Licensee will be responsible for providing 'Notice' to any Telecommunication and /or Internet Service provider to commence any work related to electrical activities that share their service space whether they are new works or repairing of existing works bar emergency situation. However, the Licensee shall provide a 'Notice' after completion of emergency work to the aforementioned service providers as stated in Section 10 of this Act;
- The Licensee can construct Overhead (Aerial) Lines along or crossing the roads, rail-lines, canals or waterways with prior permission from the Government as stated in Section 11 of this Act; and
- The Licensee shall make full compensation for any damage, detriment or inconvenience caused by them or by anyone employed by them as stated in Section 12 of this Act;

Acquisition and Requisition of Immovable Property Act, 2017

Land acquisition in Bangladesh is governed by a) the Acquisition and Requisition of Immovable Property Act, 2017 (henceforth, the 2017 Act) which repealed the Acquisition and Requisition of Immovable Property Ordinance 1982 (with subsequent amendments of the latter up to 1994; henceforth 1982 Ordinance) and b) the East Bengal State Acquisition and Tenancy Act (1950) revised in 1994. The 2017 Act provides certain safeguards for the owners and has provision for payment of "fair value" for the property acquired. The 2017 Act also gives the right to the land owner to appeal against land acquisition within 15 (fifteen) days of notice (Section 5 of the 2017 Act). The appropriate procedure for such appeals is in place. The 2017 Act, however, does not cover project affected persons (PAP) without titles or ownership record, such as informal settler/ squatters, occupiers, and informal tenants and lease-holders (without document) and does not ensure replacement value of the property acquired. The Act has no provision of resettlement assistance and transitional allowances for restoration of livelihoods of the non-titled affected persons.

The 2017 Act requires that compensation be paid for the followings: (a) land and assets permanently acquired including house, (b) loss of standing crops and trees; (c) loss of property value due to partial acquisition; (d) loss of other immovable or movable assets or source of income; and (e) relocation of living place or business and the cost incurred for such.

The Deputy Commissioner (DC) in all cases, determine "market value" of acquired assets on the date of notice of acquisition (notice under Section 9 of the 2017 Ordinance). The assessment of this market value is done considering the average price of immovable properties of the same class, with similar facilities and within the vicinity of the "to be" permanently acquired land and assets. The DC then adds 200% and 300% premium of the assessed value for cash compensation under law (CCL) of the land and assets including

house for government and non-governmental acquisitions respectively. For any other losses as specified above, i.e. from (b) to (e), the DC adds 100% premium of the assessed value to pay as compensation. The CCL paid for land is generally less than the "market value" as owners customarily report lower values during registration to avoid or pay fewer taxes. If land acquired has standing crops cultivated by tenant (bargadar)[1] under a legally constituted written agreement, the law requires that part of the compensation money be paid in cash to the tenants as per the agreement. If there is a dispute regarding the amount of compensation, there is an option for arbitration and the procedures for such is in place. Places of worship, graveyard and cremation grounds are not to be acquired for any purpose, unless the acquisition of these places is deemed unavoidable for the best of interest of the people. The proponent will be allowed to acquire such areas given that it funds the replacement and rebuilding of such places. The law requires that the salvaged materials upon payment of compensation will be auctioned out by the Government.

The DC processes land acquisition under the 2017 Act and pays compensation to the legal owners of the acquired land. The Ministry of Lands (MoL) is authorized to deal with land acquisition through the DCs. Khas[2] lands should be acquired first when a project acquires both khas and private land. If a project acquires only khas, the land will be transferred through an inter-ministerial meeting following the preparation of acquisition proposal submitted to DC/ MoL.

East Bengal State Acquisition and Tenancy Act, 1950

The land owner has to establish ownership by producing a record-of-rights in order to be eligible for compensation under the law. The record of rights prepared under Section 143 or 144 of the State Acquisition and Tenancy Act 1950 (revised 1994) are not always updated and as a result legal land owners have faced difficulties to "prove" ownership. The PAPs must also produce rent receipt or receipt of land development tax, but this does not assist in some situations when a person is exempted from payment of rent if the area of his land is less than 25 bighas (3.37 hectare).

Bangladesh Water Act, 2013

The Water Act 2013 is based on the National Water Policy, and designed for integrated development, management, extraction, distribution, usage, protection and conservation of water resources in Bangladesh.

As per this Act, all forms of water (e.g. surface water, ground water, sea water, rain water and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people. The private landowners will be able to use the surface water inside their property for all purposes in accordance with the Act. A worthwhile initiative is the requirement for permits/licenses for large scale water withdrawal by individuals and organizations beyond domestic use. Without prior permission issued by the Executive Committee, no individuals or organizations will be allowed to extract, distribute, use, develop, protect, and conserve water resources, nor they will be allowed to build any structure that impede the natural flow of rivers and creeks.

[1]Bargadar is a person who, under the system generally known as adhi, barga, or bhag, cultivates the land of another person on condition of delivering a share of produce of such land to that person.

[2]Khas land means government owned fallow land, where nobody has property rights. It is a land which is deemed to be owned by the government and available for allocation according to government priorities.

Construction of the substation and transmission lines may deteriorate the water quality. However, it should be ensured that water usage for other purposes in surrounding areas are not hampered by taking mitigation measures.

Wildlife (Conservation and Security) Act, 2012

The Bangladesh Wildlife (Conservation and Security) Act, 2012 provides the conservation and safety of biodiversity, forest and wildlife of the country by repealing the previous laws i.e. Wildlife (Preservation) Act of 1973. The Department of Forest (DoF) has the primary responsibility for implementing this Act. The key features of this Act are:

- Prohibition made in relation to wild animals and plants that no person can hunt any wild animal without a license or willfully pick, uproot, destroy or collect any plant;
- Determination of vulnerable, endangered and critically endangered species of wild animals and plants;
- Declaration of sanctuary for the conservation of forest and habitat of wildlife and prohibitions made on such sanctuary;
- Requirement of license to cultivate, extract, manufacture, rear, export or import any wild animal or part of its body, meat, trophy, uncured trophy or any plant; and
- Restriction on import, export and re-export of wild animals and plants.

This Act is applicable for this project because under this Act 'biodiversity' means genetic and species diversity of all species or sub-species of flora and fauna living in aquatic, terrestrial and marine ecosystems or diversity of their ecosystems. Wildlife species and their habitats would be damaged or disturbed due to the proposed activities for which mitigation measures need to be implemented.

The Protection and Conservation of Fish Act, 1950 and Rules, 1985

This Act and Rule cover all types of aquatic species including fish, prawn, shrimp, amphibians, tortoises, turtles, crustaceans, mollusks, echinoderms and frogs at all stages in their lifecycle and all types of water bodies. The Act specifies a number of useful fisheries management rules for sustainable fish culture and conservation in the country. These are – use of appropriate fishing gear (net, cage, trap, explosives) and building water management structures (dams, weirs, bunds and embankments). It also specifies the fishing and non-fishing seasons and the size of fish below which any prohibited species cannot be killed or sold. This Act is revised and included the banning of 'jatka[3]' of hilsa and use of synthetic mesh (locally known as 'current jal'[4]) in 2011.

Noise Pollution (Control) Rules, 2006

According to the Environment Protection Act, 1995, the government formulated the noise pollution Rules in 2006. The Rules has been improved through ECR 1997 (Amendment 2017). The ECR, 1997 (Amendment 2017) addresses the sound levels to be no more than45dB in quiet areas[5]at daytime (6 am to 9 pm) and 35 dB at night-time (9 pm to 6 am).In

[3]Any young fish returning to the sea are known as Jatka in Bangladesh. Jatka of hilsa refers to any hilsa smaller than or equal to nine inches in length;

[4]"Current Jal" means fishing net made of monofilament synthetic nylon fibre of different mesh sizes;

[5] The area within 100 meters from hospital, academic institutions or places identified/identifiable by the government;

residential areas these levels are50 dB and 40 dB, immixed area[6] 60 dB and 50 dB, in commercial areas70 dB and 60 dB and in industrial areas 75 dB and 70 dB for daytime and night-time respectively.

Disaster Management Act, 2012

The Disaster Management Act, 2012 aims to make the activities about disaster management coordinated, object oriented and strengthened and to formulate rules to build up infrastructure of effective disaster management to fight all types of disaster. Disaster means any such incidents created by nature or human.

Disaster (to certain degree) may occur in present project if any harmful situation occurs during the normal work or construction activity. Therefore, appropriate management plan should have to be taken by the project proponent to prevent any unwanted disaster in the plant.

This Act is particularly relevant to avoid accidental hazard both in construction and operation and maintenance phase. The relevance of this act for this proposed project arises as following:

- To make a disaster management plan for rehabilitation to bring back any infrastructure, life, livelihood and working environment damaged by disaster to previous condition or better condition.
- To create effective disaster management infrastructure to fight disaster and to make the public concerned and strengthened to face the disasters.
- To ensure no obstacle is created in playing fire brigade and rescue vehicles during a fire broke out, earthquake, building slide or other disaster.

Bangladesh Labour Act, 2006 and Rules, 2015

Bangladesh Labour Act was promulgated in 2006. The legislation pertains to the occupational rights and safety of factory workers and the provision of a comfortable work environment and reasonable working conditions. The amendment in 2013 has introduced a good number of important items like workers' welfare, rights and safety and industrial safety and expansion of the industry are particularly relevant for this proposed study.

This Act implies to the proposed project as it is under the industry which is responsible for transformation, generation, conversion, transmission, or distribution of electrical energy. The occupational health and safety of the workers is covered under this Act. It is mandatory for every factory to keep its workers abreast of work risk(s) through providing all personal protection equipment (PPE). Factory owners have to ensure secured power system and ensure that the exit paths are unlocked and the staircases/paths in the factories are kept open during the working hours to meet any emergency.

In 2015, Bangladesh government has introduced the Bangladesh Labour Rules. Some of the relevant points of this Rules are health and fire safety, prescribe form for filling case in Labour Court, and approval of factory plan and any extension among others.

The Bangladesh Labour Act, 2006 consolidated and repealed 25 previous labour related laws including the Dock laborers Act, 1934, the Factories Act, 1965 among others.

[6] An area, which is primarily a residential area with either or both commercial and industrial parts in it;

2.4 Relevant National Policies

Environmental Policy, 1992

Bangladesh National Environmental Policy was approved in May 1992, and sets out the basic framework for environmental action, together with a set of broad sectoral action guidelines. Key elements of the policy are:

- Maintenance of the ecological balance and overall progress and development of the country through protection and improvement of the environment;
- Protection of the country against natural disasters;
- Identification and promulgating regulation for all types of activities which pollute and degrade the environment;
- Ensuring sustainable utilization of all natural resources;
- Active association with all environmentally-related international initiatives;

Environmental policy contains the following specific objectives with respect to the industrial sector:

- To adopt corrective measures in phases in industries that causes pollution;
- To conduct Environmental Impact Assessments for all new public and private industries;
- To ban the establishment of any industry that produces goods which cause environmental pollution, closure of such existing industries in phases and discouragement of the use of such goods through the development and/or introduction of environmentally sound substitutes; and
- To ensure sustainable use of raw materials in the industries to prevent their wastage.

National Environmental Management Action Plan 1995

National Environmental Management Action Plan (NEMAP), 1995 is a wide-ranging and multi-faceted plan, which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005 and sets out the framework within which the recommendations of the National Conservation Strategy are to be implemented.

NEMAP has the following broad objectives:

- Identification of key environmental issues affecting Bangladesh;
- Identification of actions necessary to halt or reduce the rate of environmental degradation;
- Improvement of the nature and building environment infrastructures;
- Conservation of habitats and biodiversity;
- Promotion of sustainable development; and
- Improvement in the quality of life of the people.

One of the key elements of NEMAP is that sectoral environmental concerns are identified. In outline, the environmental issues of the industrial sector include the following:

- Pollution arising from various industrial processes and plants throughout the country causing varying degrees of degradation of the receiving environment (Air, Water, and Land);
- There is a general absence of pollution abatement in terms of waste minimization and treatment;
- Low level of environmental awareness amongst industrialists and entrepreneurs;
- Lack of technology, appropriate to efficient use of resources and waste minimization leading to unnecessary pollution loading in the environment;
- Economic constraints on pollution abatement and waste minimization such as the cost of new technology, the competitiveness of labor, and intensive production methods as compared to more modern methods;
- Concentration of industry and hence pollution in specific areas which exacerbate localized environmental degradation and exceed the carrying capacity of the receiving bodies;
- Unplanned industrial development has resulted in several industries located within or close to residential areas, which adversely affects human health and quality of human environment;
- Establishment of industries at the cost of good agricultural lands and in the residential areas;
- Lack of incentives to industrialists to incorporate emission/discharge treatment plant in their industries;

National Energy Policy, 2005

The National Energy Policy (NEP), 2005 of Bangladesh was formulated in 1996 by the Ministry of Power, Energy and Mineral Resources to ensure proper exploration, production, distribution and rational use of energy resources to meet the growing energy demands of different zones, consuming sectors and consumers groups on a sustainable basis. With rapid change of global as well as domestic situation, the policy was updated in 2005.
The objectives of the updated National Energy Policy (NEP) are outlined as follows.

- To provide energy for sustainable economic growth so that the economic development activities of different sectors are not constrained due to shortage of energy;
- To ensure optimum development of all the indigenous energy sources;
- To meet the energy needs of different zones of the country and socio-economic groups;
- To ensure sustainable operation of the energy utilities;
- To ensure rational use of total energy sources;
- To ensure environmentally sound sustainable energy development programmes, with due importance to renewable energy, causing minimum damage to environment;
- To encourage public and private sector participation in the development and management of the energy sector;

- To integrate energy with rural development to boost rural economy;
- To bring entire country under electrification by the year 2020;
- To ensure reliable supply of energy to the people at reasonable and affordable price;
- To develop a regional energy market for rational exchange of commercial energy to ensure energy security;

2.5 Asian Infrastructure Investment Bank (AIIB) Environmental and Social Framework

Asian Infrastructure Investment Bank (AIIB) is financing this proposed power system network project; therefore, compliance with AIIB's Environmental and Social Framework (ESF) is an integral part of this study. The reason is that AIIB requires the Client to conduct an environmental and social impact assessment (ESIA) for the project and to prepare an environmental and social management plan (ESMP) in the ESIA report of the Project, in accordance with the **Environmental and Social Policy (ESP),** which sets forth mandatory environmental and social requirements for each Project under this framework.

The important element of the framework is **Environmental and Social Standards (ESS),** where three associated environmental and social standards (ESSs) set out more detailed mandatory environmental and social requirements relating to the following:

Table 2.1: Environmental and Social Standards (ESS) for AIIB

Environmental and Social Standards		Requirement	Trigger
ESS 1	Environmental and Social Assessment and Management	To conduct an environmental and social assessment relating to these risks and impacts, and design appropriate measures to avoid, minimize, mitigate, offset or compensate for them;	Yes
ESS 2	Involuntary Resettlement	If the Project would result in Involuntary Resettlement, to address this in the social section of the assessment report, complemented by more in-depth coverage, as required under ESS 2. The client is required to prepare a resettlement plan for this component;	Yes
ESS 3	Indigenous Peoples	If the Project would affect Indigenous Peoples, to address this in the social section of the assessment report, complemented by more in-depth coverage, as required under ESS 3;	No

2.6 Screening and Categorization Requirements

AIIB screens and categorizes each proposed project to determine the nature and level of the required environmental and social reviews, type of information disclosure and stakeholder engagements for the respective project. The project's category is determined by the category of the project's component that presents the highest environmental or social risk, including direct, indirect, cumulative and induced impacts, as relevant, in the project area. AIIB assigns each proposed project to one of the following four categories as addressed in Table 2.2 below.

Table 2.2 Screening and Categorization of AIIB Projects

Category		Applicability
Category A	A project is categorized as 'Category A'if it is likely to have significant adverse environmental and social impacts that are irreversible, cumulative, diverse or unprecedented.	-
Category B	A project is categorized as 'Category B' when it has a limited number of potentially adverse environmental and social impacts; the impacts are not unprecedented; few if any of them are irreversible or cumulative; they are limited to the project area; and can be successfully managed using good practice in an operational setting.	Considering the potential negative and positive environmental impacts of this proposed project and their management, it is appropriate to fit the Project into Category B under AIIB ESF categorization. This is because the impacts are mostly bound to occur in the Project area and the impacts are manageable with proposed mitigation and monitoring measures.
Category C	A project is categorized as 'Category C' when it is likely to have minimal or no adverse environmental and social impacts.	
Category FI	A Project is categorized FI if the financing structure involves the provision of funds to or through a financial intermediary (FI) for the project, whereby the Bank delegates to the FI the decision-making on the use of the Bank funds, including the selection, appraisal, approval and monitoring of Bank-financed sub-projects.	

For Category B Projects, AIIB determines the appropriate environmental and social assessment documentation required on a case-by-case basis, but it is usually only an environmental and social management plan (ESMP) or environmental and social management planning framework (ESMPF) (or both, if applicable). As the proposed project was originally Red Category under the national law (before ECR 1997, Amendment 2017), so anEIA report wasprepared to meet up the condition of national obligation and clearance certificate was obtained from the DoE for this project (Annex-I).

2.7 Implication of Legal Aspects on this Project

2.8 Administrative Procedures for Obtaining Location/Environmental Clearance

The legislative bases for environmental assessment for the proposed power system network development project intervention are the ECA, 1995 (with subsequent amendments) and the ECR, 1997 (with subsequent amendments). According to the ECA, 1995, the proponent must obtain an ECC from the DoE in the manner prescribed by the Rules.

Environmental clearance has to be obtained in two steps: firstly, a site clearance and thereafter, an environmental clearance. An ECC is issued to all existing and proposed industrial units and projects falling under the Green category as identified in the ECR, 1997.For all other categories and SCC is required prior to obtaining the ECC.

Like all other projects, this project also needs to meet the requirement of the DoE. An environmental assessment study needs to be undertaken for obtaining the environmental clearance. The procedure to obtain an Environmental Clearance Certificate for this Project which fell under the 'Red' category then ECR, i.e. prior to the amendment made to the ECR on December 2017, required submission of the following documents along with the application for clearance certificates:

- Feasibility Report for the Project (where applicable)
- Environmental Impact Assessment (EIA) Report
- Environmental Management Plan (EMP)
- No Objection Certificate from relevant Local Authority (where applicable)
- Other necessary information (where applicable)

Public participation or consultation is not a condition in the ECR 1997 and/or EIA Guidelines; however, DoE prefers the proponent to do public consultation during the assessment and puts condition for it while providing site clearance or during the approval of the EIA'sTerms of Reference (ToR).

The steps followed to obtain the ECCfor this Project from the DoEis outlined in **Figure 2.1**.

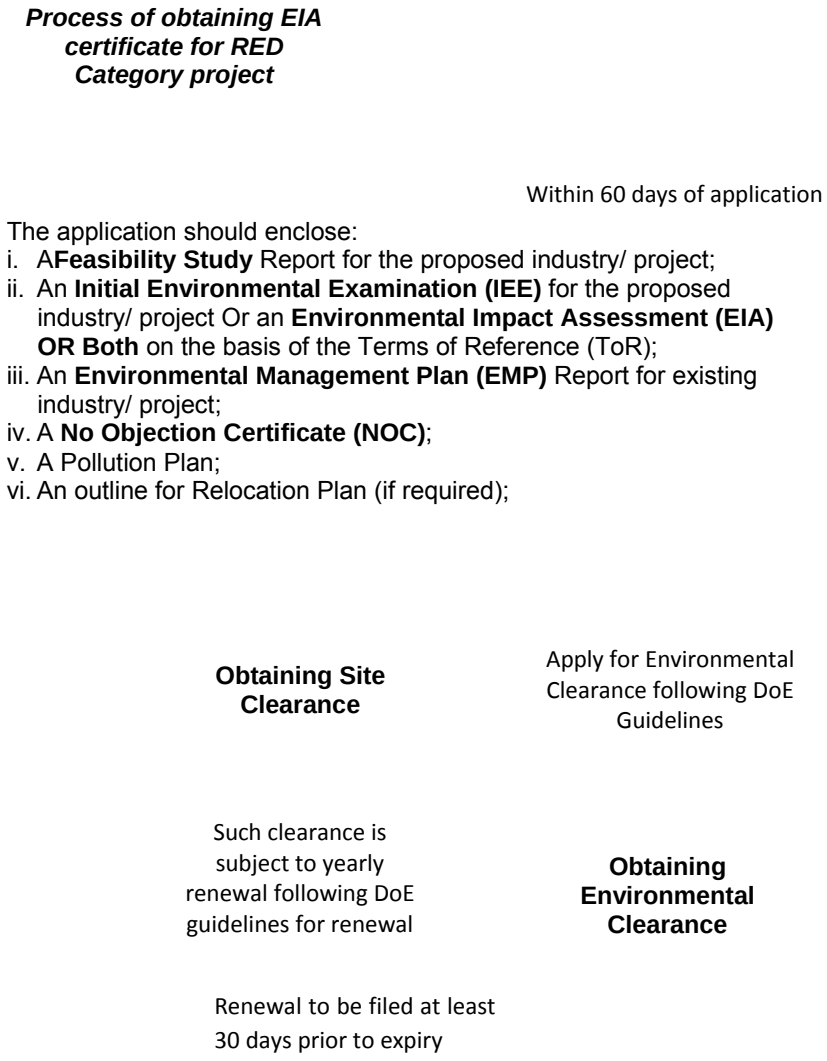


Figure 2.1: Steps Involved in Environmental Clearance following the DoE Guidelines

2.9 Organization Related to Enforcement of Environmental Standards

The Department of Environment (DoE)**,** the technical arm of the Ministry of Environment and Forest (MoEF), is the regulatory body and the enforcement agency of all environmental related activities. It is the responsible body for reviewing and approving thereports required for obtaining SCC and ECC in Bangladesh.

The DoE is headed by a Director General (DG). The DG has complete control over the DoE. The power of the DG, as given in the Act, may be outlined as follow:

- The DG has the power to close down the activities considered harmful to human life or the environment. The operator has the right to appeal and procedures are in place for this. However, if the incident is considered an emergency, there is no opportunity for appeal;

- The DG has the power to declare an area affected by pollution as an ecologically critical area (ECA). The DoE governs the type of work or process, which can take place in such an area.
- Before undertaking any new development project, the project proponent must obtainan SCC and an ECC from the DoE when required (based on the category the project falls under). The procedures to take such clearance are in place.

Failure to comply with any part of ECA 1995 (amendment 2010) may result in punishment by a maximum of 10 years imprisonment or a maximum fine of BDT 1,000,000/- (approximately USD12,221.70)[7] or both.

2.10 Comparison with IFC Standards and Justifications of their Requirements

Air, water and noise have been identified as the environmental components that will be impacted due to the Project intervention on-site and the surrounding areas of the Project. As such, the existing national regulations and International Finance Corporation (IFC) standards for these components have been compared in this section. Subsequently, justifications have been provided as to why these standards would need to be followed for each of the respective components.

2.11 Air Quality

The air quality is usually measured based on the average concentration in micrograms (µg) per cubic meter (m^3)within a specified timeframe of the following five components in the air: Nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), particulate matters less than 10 micron in diameter (PM_{10}), particulate matters less than 2.5 micron in diameter ($PM_{2.5}$) and Ozone (O_3). Table 2.3 can be used to comparenational and IFC standards for air quality.

Table 2.3: Air Quality Standard Comparison

Component	Standard	Yearly (µg/m^3)	24hrs.(µg/m^3)	8 hrs. (µg/m^3)	1 hour (µg/m^3)
NO_2	National	100	-	-	-
	IFC	40	-	-	200
SO_2	National	80	365	-	-
	IFC	-	125 (IT-1)		
PM_{10}	National	50	-	-	-
	IFC	50 (IT-2)	150 (IT-1)	-	-
$PM_{2.5}$	National	15			
	IFC	25 (IT-2)	75 (IT-1)	-	-
O_3	National			157	235
	IFC	-	-	160	-

Sources: National Standard:ECR, 1997 (Amendment 2017) and IFC Standard: Environmental, Health, and Safety Guidelines - General EHS Guidelines: Environmental: 1.1 Air Emissions and Ambient Air Quality (2007) which is based on WHO/SDE/PHE/OEH/06.02; IT=Interim Target (See guideline for IT details.)

The Table 2.3 above clearly identifies that IFC Standards based on the World Health Organization (WHO)for concentrations of $NO_2$and $SO_2$are more stringent. On the other hand,

[7]1 USD (United States Dollar) = 81.8217 BDT (Bangladesh Taka) on March 5, 2018.

concentrations of PM_{10}, $PM_{2.5}$ and$O_3$are more stringent in the national rules. The national 'Rules 'identifies the concentrations of lead (Pb), Carbon monoxide (CO) and suspended particulate matter (SPM) in the air in addition which makes it more broadly applicable as a tool for air quality guideline.

This Project will involve construction works which will significantly increase the concentration ofPM_{10}, $PM_{2.5}$ levels in the air unless they are mitigated or minimized through appropriate measures; thus, the national rules for air quality will be more appropriate for this Project.

2.12 **Water Quality**

The ECR, 1997 (Amendment 2017) has more detailed water quality guideline in comparison to the IFC Standards. The ECR, 1997 (Amendment 2017) clearly specifies the water quality based on usage, such as drinking purpose, entertainment purpose, cooling purpose, fish culturing purpose, irrigation purpose etc. It also clearly identifies significant number of components compared to the IFC Standards. The ECR, 1997 (Amendment 2017) covers a wide range of components – from the concentration of dissolved oxygen to the level of poisonous and radioactive materials. As a more detailed quality measurement guide, ECR 1997 (amendment 2017) is given priority by the DoE.

2.13 **Noise Quality**

The noise levels are more stringent in the national rules, i.e. in the ECR, 1997 (Amendment 2017), in comparison to the IFC Standards. The DoE uses the ECR, 1997 (Amendment 2017) as a basis to identify noise pollution due to the project intervention. Table 2.4 below will allow to have a quick glimpse on the noise levels of ECR 1997, ECR 1997 (Amendment 2017) and the IFC Standards.

Table 2.4: Noise Quality Standard Comparison

Component	Time Period	ECR, 1997	ECR 1997 (Amended 2017)	IFC 2007
Quiet Area (QA)	Daytime[8]	50dBA	45dBA	-
	Night-time[9]	40dBA	35dBA	-
Residential Area (RA)	Daytime	55dBA	50dBA	55dBA
	Night-time	45dBA	40dBA	45dBA
Mix Area (MA)	Daytime	60dBA	60dBA	-
	Night-time	50dBA	50dBA	-
Commercial Area (CA)	Daytime	70dBA	70dBA	70dBA
	Night-time	60dBA	60dBA	70dBA
Industrial Area (IA)	Daytime	75dBA	75dBA	70dBA
	Night-time	70dBA	70dBA	70dBA

Sources: National Standard OLD: ECR, 1997 National Standard NEW (ECR Amendment 2017) and IFC Standard: Environmental, Health, and Safety Guidelines - General EHS Guidelines: Environmental: 1.7Noise Management (2007); MA: Primarily an RA combined with CA and/ or IA.

This Project was enabled before the amendment of ECR, 1997 in December 2017; thus, the EIA used the ECR 1997 noise levels to obtain clearance certificates from the DoE.

Any construction activity will generate noise. Thus, noise quality will be compromised due to this Project intervention. As the national standards for noise quality is better defined and more stringent, these standards have been used for this Project.

[8] Daytime is defined between 600 and 2100 hrs. in national rules; For IFC, this is between 700 and 2200 hrs.

[9]Night-time is defined between 2100 and 600 hrs. in national rules; For IFC, this is between 2200 and 700 hrs.

3. Approach and Methodology

3.1 Approach

The process followed in conducting the Environmental and Social Impact Assessment (ESIA) study of the proposed transmission line projects is shown in Figure 3.1.

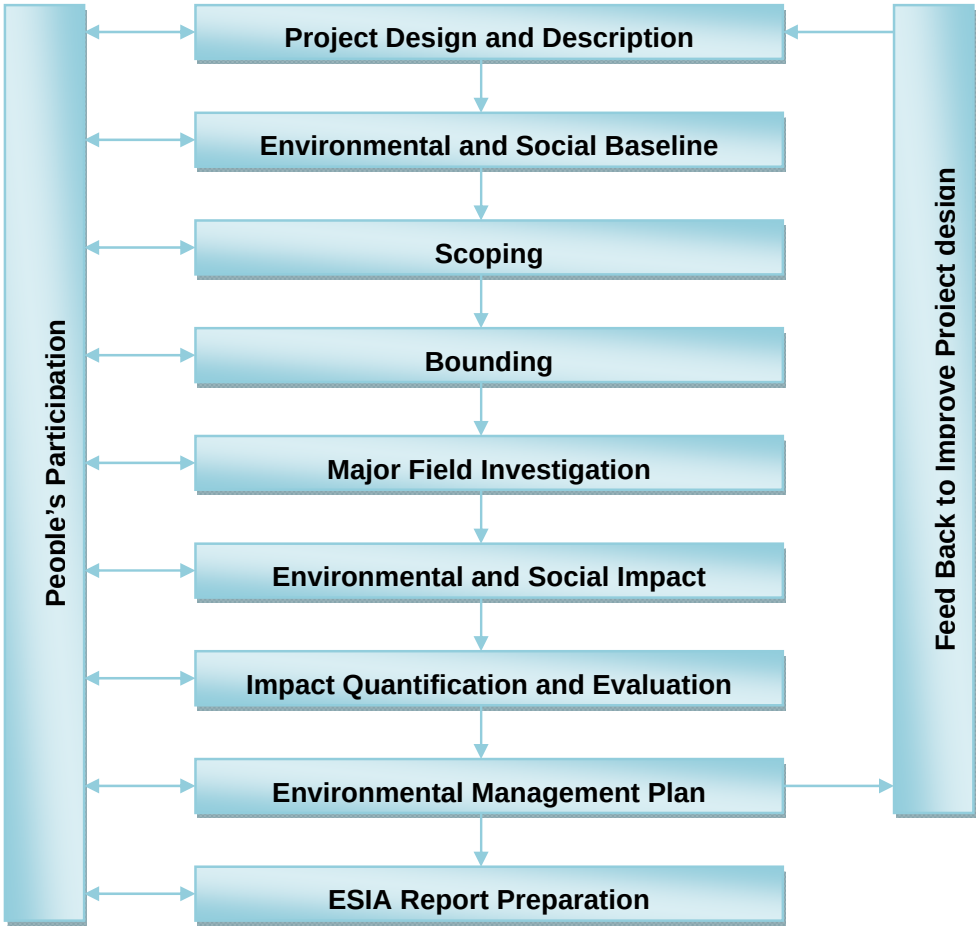


Figure 3.1: Process followed in the ESIA study

The activities at each stage of the ESIA study of the proposed transmission lines are briefly described below:

3.2 Project Design and Description

Environmental impacts are triggered by physical interventions in the natural system for which it is essential to understand the proposed interventions while conducting ESIA studies. Detailed information about project was collected from PGCB by the multi-disciplinary ESIA team members for gaining a thorough understanding of the proposed interventions and their possible environmental consequences. This information helped in designing data collection programs. The following issues have been included in the brief description of the project:

- Location of the project and its accessibility;
- Use of natural resources i.e. water and its sources;
- Use of power and its sources;
- Use of raw materials, fuels and chemicals, their quantities, characteristics, arrangements for transport to site, and storage facilities;
- Products and by-products, their storage and transport;
- List of main equipment and machinery, built-in pollution control equipment, description of detailed manufacturing process (temperature and pressure conditions of each unit operation);
- Quantities of solid, liquid and gaseous waste generated, and their points of generation;
- Noise level produced by equipment and machinery at source and capital and operating costs of pollution control;
- Layout map (1:1000 scale) showing different units, roads, storage, water supply lines, sewerage, storm drainage, water pools housing, green belt etc.

3.3 **Environmental and Social Baseline Survey**

CEGIS conducted the baseline survey with the help of iPAD (**Map 3.1** and **Map 3.2**). The KMZ (keyhole marked up zipped)files of the proposed lines were opened in iPAD through Google earth and followed the route exactly. It is convenient to locate the current position of the iPAD holder quickly that help to adjust the position with the route of T/L and cross check the location with Map through ground truthing.

Map3.2: Madunaghat to Khulshi T/L

Map3.3: Anowara to New-Mooring T/L

All the parameters selected in previous step may not be significant for the project; hence a reconnaissance survey was done to shorten this list to concentrate on significant effects. Also data has been collected from all possible secondary sources, whichever are available. Environmental and socio-economic data from different sources (BBS, DoE, BMD, BWDB, Agro-climatic survey of Bangladesh and other reports) of the proposed project area were collected to prepare the baseline environmental and socio- economic profile of the study area. Consultant's Multi-disciplinary team of experts made reconnaissance visits to observe the condition of the project site and its surroundings and to identify various sites for investigation.

Then final checklists were prepared and environmental baseline survey was conducted with the relevant checklist in hand to identify and delineate the significant effects of the project.

The environmental and social baseline condition of the proposed project area has been developed by collecting relevant data from primary and secondary sources. Under the ESIA study, available data on climate, geology, seismicity, water resources, land resources, soil properties, agriculture, fisheries, ecology and socio-economic components have been collected from secondary sources followed by primary data collection.

The study team made a number of field visits to the proposed interventions and collected primary data on environmental and social components using RRA techniques. During the field visits, the multidisciplinary ESIA team members made professional observations pertaining to their individual areas of expertise. Local knowledgeable persons and community representatives were also interviewed.

All qualitative and quantitative information have been gathered from different surveys and secondary sources and used appropriately in preparing the environmental and socio-economic baseline of the project. All primary data and information here should be considered as the expert estimation and opinion of local people and project stakeholders.

Data from secondary as well as primary sources on physical environment, water resources, land resources, agriculture, fisheries, eco-systems and socio-economic condition have been collected for establishing the baseline condition for the project. Resource based parameters or criteria on which data have been collected including the data sources methodology of collection are presented in the following sections.

3.3.1 Physical Environment

The professional observation of the multi-disciplinary team members backed by feedback from the local people during field visits was the main tool of physical environmental observation. The examination of physical environmental was backed by secondary data, high resolution recent satellite images and field observation. In general, the physical environmental data collection and survey has been carried out by a composite method of investigation including remote sensing image analysis, observation, and public consultation. Analysis has been carried out with world standardized tools and the result presented with GIS interface.

The geological and seismic issues have been investigated using secondary information and field observation. The general geological features and the seismicity of the project and its surrounding areas have been collected from available secondary literature and the Geological Survey of Bangladesh. The lithology of the project area has been collected from the National Water Resources Database (NWRD) of WARPO.

Meteorological data such as rainfall, evapo-transpiration, temperature, sunshine hours, humidity, and wind speed and wind direction have been collected and analyzed for assessing local climate that are directly related to water resources of the study area. Meteorological data for selected stations have been collected from BMD station for Meteorology data Patenga (Chattogram) and Ambagan (Chattogram) the NWRD of WARPO, which contains long series of temporal data showing daily values for meteorological stations maintained by the Bangladesh Meteorological Department (BMD).

3.4 **Water Resources**

Information on water resources have been collected from secondary sources. The Karnafuli River (SW- 153, Double Mooring) for Sangu river (SW- 248, Chandanaish and SW 249, Ichhakhali) systems of the study area have been selected for hydrological data collection. Data on specific fields of interest on special hydrological events such as drainage congestion, water logging, erosion – sedimentation etc. have been collected.

Water resources data under four broad headings namely river hydrology, groundwater hydrology, ground and surface water quality and use have been collected from secondary sources.

3.5 Land Resources

The baseline for land resources has been developed by considering the criteria of Agro-Ecological Zone (AEZ), land type with net cultivable area (NCA), land use and soil texture. The identification and development of baseline condition has been carried out through the following process:

The AEZ of the proposed project area has been identified using information from secondary sources (BARC, 2012). Information on land type, soil texture, and soil nutrient status has also been collected from different publications of Soil Resource and Development Institute (SRDI).

The secondary data on these parameters have been verified at field level through physical observations as well as during consultation with the local people and officials of the Department of Agriculture Extension (DAE) during field visits.

Field surveys have been conducted to collect ground-truth data on current land use/ land cover, soil texture etc. Finally, maps of the land use/land cover, soil texture etc.have been produced through digital classification with the help of ground-truth data.

3.6 Agricultural Resources

Data collected on agricultural resources include existing cropping patterns, crop variety, crop calendar, crop yield, crop damage and agricultural input used. Agriculture data have been collected from primary sources through extensive field survey by developing questionnaires and in consultation with local people and relevant agricultural officials. Data on agricultural resources have also been collected from secondary sources (Upazila Agriculture Extension office of the DAE).

3.7 Fishery Resources

Fisheries data have been collected for this study by considering the seasonal variance of dry and wet seasons. Prior to data collection, a checklist/ questionnaire were developed. The checklist included all kinds of information which should be looked into in the context of existing and potential structures of the project. A combination of survey techniques were used for data collection. The survey techniques included sampling site selection, data collection, data analysis and reporting.

3.8 Ecological Resources

Ecological data have been collected from primary and secondary sources. The primary sources are mainly Line Transect Walks (LTWs) and Key Informant Interviews (KIIs);the secondary sources were from Forest Department, International Union for Conservation of Nature (IUCN), Bangladesh Asiatic Society's Encyclopedia of Flora and Fauna of Bangladesh, Bangladesh National Herbarium (BNH) and other relevant sources through literature review. In addition, the Bio-Ecological Zone (BEZ) classification of Bangladesh by IUCN-Bangladesh (2002) has been used for the bio-ecological zoning of the study area.

Based on information from the project site map, a field survey has been conducted to list the available flora and fauna as well as habitats in the study area. The surveys included LTWs (50 meter distances from both sides of the RoW) within the study area covering all major habitats. The status of the threatened species has been mentioned in this report in reference to IUCN- Bangladesh Red List 2015.

3.9 Socio Economic Resources

To establish a baseline for this ESIA study, data have been collected from different sources which can be grouped into two categories:
Primary sources

Data have been collected from the project area and concern unions and Municipalities of Chattogram districts through Questionnaire Survey, RRA, PCM, and informal interviews.
Secondary sources

To prepare the baseline situation of the study area, information on some important socio-economic parameters has been collected from the reports of the Bangladesh Bureau of Statistics (BBS), 2011 and estimated for 2016.

Technique of data collection

Different techniques have been used to gather relevant information on the existing socio-economic condition of the study area. Quantitative and qualitative data have been collected from secondary and primary sources. Quantitative data have been collected throughliterature review, Survey, FGDs and KIIs, informal interviews and PCMs (**Table 3.1**).

Table3.1: Variables and Associated Data Collection Techniques

Variables	Techniques
Demographic and household information	Literature review
Quality of life	RRA, Survey
Safety net & poverty reduction measures	RRA, informal interview
People's perception	PCM, RRA

The data collected from PCMs, RRAs and informal interviews have been analyzed using appropriate statistical tools and instruments. The sum and percentage of total values have been used to specify the percentage of households containing different values on different variables.

3.10 Prediction of Probable Impacts

The project implementing periods i.e. pre, during and post project situations were considered for the impact assessment. At this stage, local people's opinions obtained at the major field investigation stage were duly considered. Environmental impacts of the proposed interventions on the IESCs have been assessed through several sets of activities. The statuses of the IESCs under baseline conditions have been predicted considering the possible changes under pre, during and post project situations conditions.

The differences found between the two conditions have been considered as the impacts of the proposed interventions on the IESCs. Changes expected to be brought about due to the implementation of the project have been assessed using professional judgment of the multi-disciplinary IEE team members based on information collected during the field investigation and feedback received through intensive stakeholder consultation to generate in the future condition.

The impacts have been addressed in three categories i.e. No impact (0); Negative Impact (-) and Positive Impact (+). The magnitude of impacts has defined mostly in one to five (1-5) scales i.e. low impact is (+/-1) relevant with 1% to 20% impact ranges, medium low impact is (+/-2) relevant with 21% to 40% impact ranges, medium impact is (+/-3) relevant with 41% to 60% impact ranges, high impact is (+/-4) relevant with 61 % to 80% impact ranges and very

high impact is (+/-5) relevant with 81% to 100% impact ranges respectively. The assessment has covered both the positive and negative impacts and considered in the preparation of the environmental and social management plan.

3.11 Potential Impact Identification

This step focuses to determine what changes could potentially occur to the resources/ receptors due to implementation of the project and its associated activities. From the potentially significant interactions identified in scoping, the potential impacts to the various resources/receptors are elaborated and evaluated. The important environmental and social components are described in Chapter 9.

3.12 Potential Impact Assessment

Once the potential impacts are identified, each potential impact is described in terms of its various relevant characteristics (e.g. type, scale, duration, frequency, extent).

The potential impacts are qualitatively assessed based on the above characteristics to determine whether it is potentially significant or not.

3.13 Assigning Significance and Likelihood

Following the assessment of magnitude, the quality and sensitivity of the receiving environment or potential receptor has been determined and the significance of each potential impact has been established using the potential impact significance matrix shown in **Table 3.2**.

Table 3.2: Assessment of Potential Impact Significance

Magnitude of Potential Impact	Sensitivity of Receptors			
	Very High	High	Medium	Low / Negligible
Major	Critical	Major	Moderate	Negligible
Moderate	Major	Major	Moderate	Negligible
Minor	Moderate	Moderate	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Criteria for determining the likelihood of the Project's potential impacts are outlined in **Table 3.3.**

Table 3.3: Criteria for Determining Likelihood of the Potential Impacts

Likelihood Determination	Definition
1 (Negligible)	Insignificant chance of occurring
2 (Low)	Very minimal chance of occurring
3 (Medium)	May occur considering if the conditions are abnormal or exceptional
4 (High)	Occurs more frequently and without any prior warnings

3.14 Scoping

A scoping process was followed for identifying Important Environmental and Social Components (IESCs), which are likely to be impacted by the 230/132/330 kV transmission lines and substation areas.. This was done in two stages. Individual professional ESIA team members made a preliminary list of the components pertaining to their disciplines, which could be impacted by the project. The second stage included village-scoping sessions where

stakeholder perceptions were obtained about the environmental and social components, which could be impacted by the project interventions. Professional judgment of the ESIA team members as well as the stakeholder opinions obtained in the village scoping sessions were considered in selecting the IESCs.

3.15 **Bounding**

The geographical boundary of the "General Impact Area - GIA" and the potential “Direct Impact Area - DIA” were delineated as a requirement of the environment assessment study. The GIA is the physical location of the proposed power transmission lines of the project while the "DIA" covers the geographic extent of the environmental and socioeconomic impacts resulting from implementation of the proposed power transmission lines including pre-construction, construction and post-construction conditions. It is recognized that the benefits of the proposed 230/132/33 kV T/L will extend to the regional as well as national scale. For the ESIA, the focus of the study was limited to areas where the impacts of the activity will be directly felt. Twenty meter buffer along both sides of the power transmission lines are considered for environmental analysis. However, the major emphasis was given to the 20m RoW of the proposed transmission lines. So, in total 80 m (30 left side + 20 m middle side + 30 m right side) RoW is considered for the ESIA study area for the 230kV and 400 kV TL, total 100 m (40 left side + 20 m middle side + 40 m right side) RoW is considered for the ESIA study area. A general socioeconomic profile was prepared for the administrative units over which the power transmission lines shall traverse.

3.16 **Major Field Investigation**

Data on the IESCs were collected through RRA, PRA, and FGD using checklists for water resource, agriculture, ecosystem and socio-economic components. Intensive consultation with the local people was carried out in each case for securing people’s participation. The multidisciplinary ESIA team members also made professional observations during the field visits. The concentration was on the historical status of the IESCs and the possible condition of the same against the proposed interventions.

Information on individual households whose land and livelihood could be permanently or temporarily impacted was collected through a questionnaire survey which was developed and field-tested before conducting the actual survey.

3.17 **Identification of Mitigation and Enhancement Measures**

Once the significance of potential impact has been characterized, the preliminary mitigations and enhancement measures are suggested in the Section-10 of this ESIA report.

3.18 **Environmental Management Plan**

Negative impacts, assessed in the previous stage, were picked up and mitigation measures were suggested for minimizing their affects. Compensation measures were suggested for the negative impacts that could not be mitigated. Likewise positive impacts, also assessed in the previous stage, were picked up and enhancement measures were suggested for increasing their benefits.

3.19 **Public Consultation**

Public consultation is necessary for identifying the problem and solution across the intervention by following participatory approach. This starts from environmental and social baseline stage when data and information on problems are collected from the directly and indirectly project impacted people. Their perceptions were considered in the selection of important environmental and social components through the scoping process.

Some formal consultation was done during ESIA study and some formal consultation meetings were conducted after completing detailed survey for project affected person, CEGIS arranged a formal consultation meeting with project affected people at Khulshi. Along with this CEGIS study team also communicated with local government authority to inform them and to pick their perception regarding this project. A participatory approach was followed during consultation meeting.

3.20 **Environmental Monitoring Plan**

Finally, an environmental monitoring plan was prepared for detecting changes taking place in the environmental and social components due to project implementation.

3.21 **Budget for Environmental Management Plan**

A tentative budget has been prepared for implementing environmental management plan for the proposed project. In this budget, mitigation cost, enhancement cost, contingency costs are included. The monitoring costs during implementation period also included within this budget.

3.22 **ESIA Report Preparation**

This ESIA report has been prepared based on the findings of the ESIA study conducted for the proposed Chattogram divisions Transmission line and Substations area.

4. Description of the Project

4.1 Background of the Project

The existing and proposed 400 kV, 230 kV and 132 kV grid networks in Bangladesh are presented in the Figure 4.1. According to the Figures, there are some gaps to be fulfilled. Power Grid Company of Bangladesh Limited (PGCB) intends to construct new substations and transmission lines at Chattogram in Bangladesh. The PGCB engineers have carried out a study of the whole transmission network. The study shows that a considerable numbers of grid substations and transmission lines (TL) in the Chattogram area are going to fall short of capacity when the new electricity generation will be added to the national grid. It can be envisaged that to address the boosting of load demand and ensure reliable electricity supply to concerned urban and sub-urban areas, some new 230/132 kV and associated transmission lines are required. This will not only increase the operating contingency of the system but will also overcome the limitations of supplying quality and uninterrupted electricity to end users. Considering the present and future demand of the area, “Expansion and Strengthening of Power System Network under Chattogram Area” is taken in connection with Power System Master Plan (PSMP)-2016 and Prioritized Investment Plan for transmission network in the Year 2015-2020.

This project has been proposed to be included in the Seventh Five Years Plan. Under this Project– a) aGas Insulated Switchgear (GIS)based 230/132kV substation to be constructed at New Mooring, b) an existing Air Insulated Switchgear (AIS) based 132/33KV substation will be dismantled and upgraded to a GIS based 230/132kV substation at Khulshi, c) a 25.182 km long 400kV transmission line (19.932km overhead and 5.25 km underground)will be constructed between Anowara and Anandabazar (New Mooring), d) a 2.66 km long 230kV line-in-line-out (LILO) double circuit underground transmission line will laid from Hathazari to Rampur, e) a 14.56 km long 230kV underground transmission line will be laid from Madunaghat to Khulshi and f) two 230kV GIS bays will be constructed at Madunaghat. The proposed substations and associated transmission lines will contribute 1800 MVA transformer capacity at 230 kV level and 360 MVA of transformer capacity at 132 kV level. After analyzing the Grid network and load demand forecast of the new/ upgrade of substation and bay extension works, interventions under the Project have been finalized.

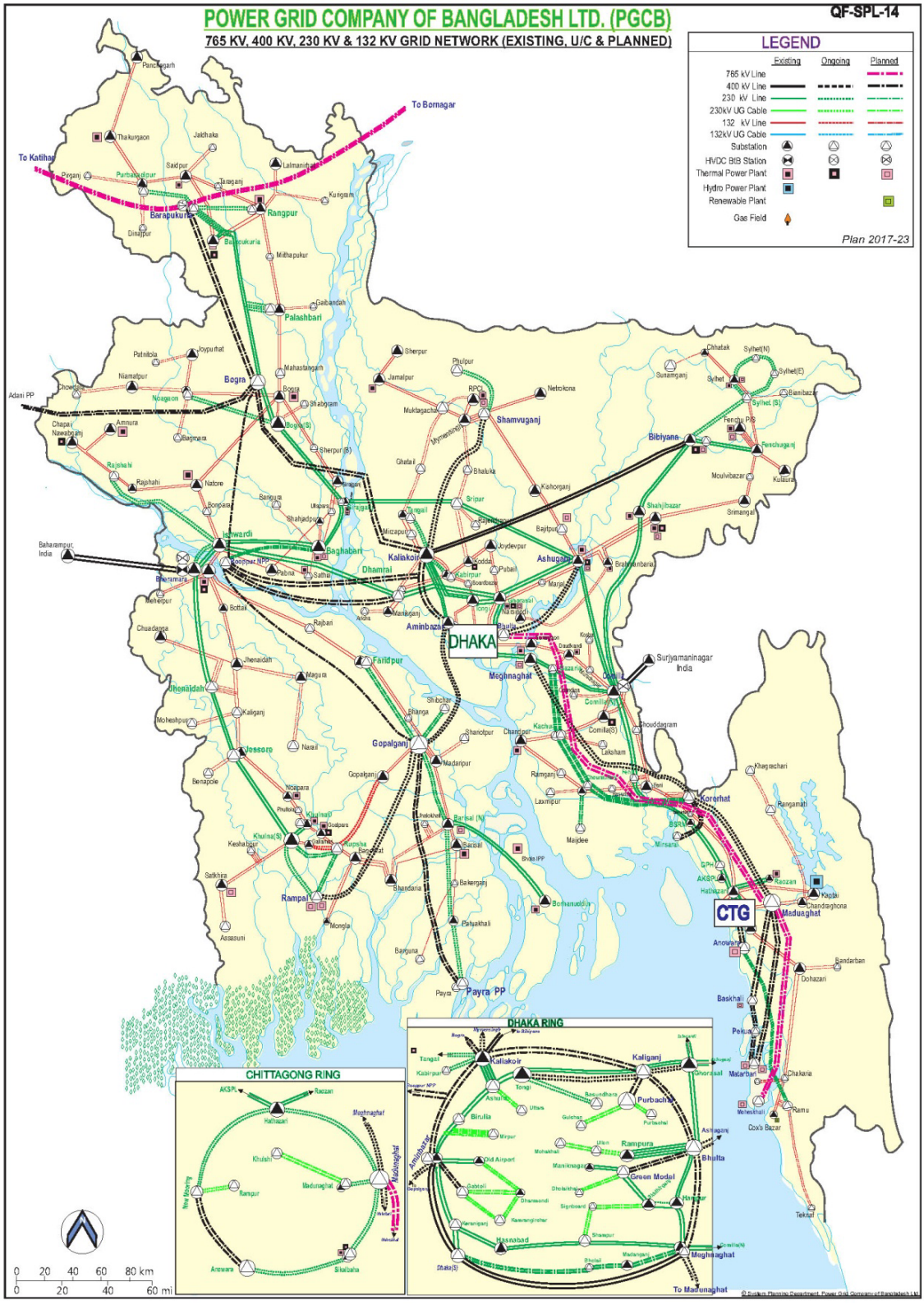


Figure 4.1: Proposed and Existing 400kV, 230kV and 132kV Grid Network of PGCB in Bangladesh

4.2 Major Components of the Project

Major components of the projects are given below:

- Construction/ upgradation of substations (GIS based)
- Construction of associated overhead/underground TL

Interventions under the project are given in **Table 4.1**.

Table 4.1: Interventions under the Project

Sl. No	Substation Location and Type	Capacity	Associated Transmission Line[2]	Bay Extension	Required Land	GIS Type
1	New Mooring 230/132 kV GIS Substation[1]	2x350/450 MVA	Anowara-New Mooring 400 kV double circuit line:25.182 km (Overhead 19.932km and Underground 5.25km); LILO of Hathazari-Rampur 230 kV at New Mooring: 2.66 km doublecircuit underground cable	-	18 Acre (72843.4 m^2)	Indoor
2	Khulshi230/132/33 kV GIS Substation	2x350/450 (*230/132 kV*) and 3x80/120 *(132/33 kV*)	Madunaghatto Khulshi 230 kV double circuit Underground cable transmission line: 14.56km	2 x 230 kV GIS Bay at Madunaghat	Existing Land	Indoor
	Total		**42.402 Km**			

[1]132/33kV New Mooring Substation will beconstructed under another Project in which 18 acre land would be acquired and under this project 230/132 kV SS will be constructed inside aforementioned land (As because there will be enough land after constructed the 132/33 kV GIS SS) ;
[2]the length of the proposed transmission line is provided based on the route survey;
Source: PGCB, System Planning, 2016

4.3 Project Location

The Project is located in Chattogram covering South-East Zone of Bangladesh**(Figure 4.2).**The propose study area will cover Twenty Five (25) unions belonging to Eight (8) Upazilla/ Thanas in Chattogram district. A map showing all the project interventions is given in

Figure 4.2: Map of Projectlocation that covers the south-east Zone of Bangladesh

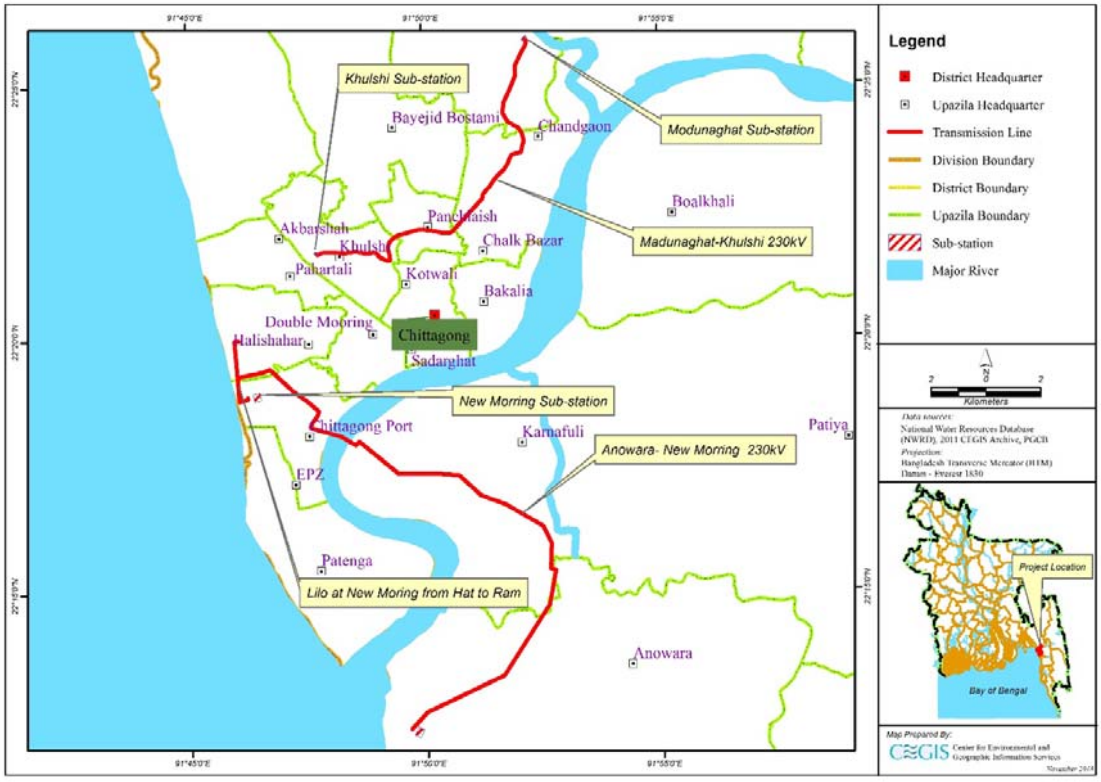


Figure 4.3: Map of Project location showing all the inteventions

4.4 Physical Features of Substations

Two GIS based substations are going to be part of this project.

4.5 Gas Insulated Switchgear (GIS)

In GIS based systems, all the live components are enclosed in a grounded metal enclosure, and then the whole system is housed in a chamber full of gas. GIS based substations primarily use sulphur hexafluoride (SF_6) gas as the primary insulator. SF_6 is non-toxic, maintains atomic and molecular properties even at high voltages have high cooling and superior arc quenching properties.

In addition, it is safe. SF_6 has superior dielectric properties compared to other gases; thereby, provides favorable insulation for the phase to phase and phase to ground moderation. In the substation setup, the gas is contained in a grounded metal enclosure containing the conductors, current and voltage transformers, circuit breaker interrupters, switches, and lightning arrestors.

Advantages of GIS

1. The earthed metal enclosure makes for a safe working environment for the attending personnel;
2. Compartmentalized enclosure of the live parts makes for a very reliable system due to reduced disruption of the insulation system;

3. By reducing the distance between active and non-active switchgear parts, less space is required in comparison to the normal AIS based system;
4. Low maintenance requirements due to expedient design and protection against external elements;
5. Under scheduled maintenance, SF_6 neither ages nor depletes. There is no need to "top up" the gas levels throughout the equipment lifetime (approx. 40 years);
6. Quick assembly due to extensive pre-assembly;

Disadvantages

1. High installation costs compared to AIS based systems;
2. Procurement and supply of SF_6 gas can be a problem especially in rough terrain and offsite locations; thereby further increasing the costs;
3. High level of maintenance is required; this requires highly skilled personnel;
4. Internal faults tend to be very costly and severe when they occur; these faults often lead to long outage periods; for example, the use of impure gas, as well as presence of dust can lead to flashovers and explosions;

The substations have electrical specifications for voltage, switchgear, circuit breaker, transformer, and protection systems. The key physical features of the substations are given in **Table 4.4** and **Table 4.5** below.

Table 4.4: Physical Features of the New Mooring 230/132 kV Switching GIS SS

Features	Specification
Type	GIS (Indoor)
Land Ownership	18 acre land acquired by PGCB
Voltage Levels	230/132 kV
Transformer Fault Capacity	2X300/450 MVA
Insulation Medium Power Circuit Breaker	SF_6 Gas
Transformer Insulation	Gas Insulated
Control System	Both manual and automation
Communication System	Optical fiber communication
Fault Detector	Relays
Fire Protection System	Auto Fighting Water Spray System
Duration of Project Implementation	Approximately 30 months form the contract signing

Source: PD Office, PGCB

Table 4.5: Physical Features of the Khulshi230/132/33 kV Switching GIS SS

Features	Specification
Type	GIS (Indoor)
Land Ownership	Pre-owned by PGCB
Voltage Levels	230/132 kV
Transformer Fault Capacity	2x350/450 (*230/132 kV*) 3x80/120 *(132/33 kV*)
Insulation Medium Power Circuit Breaker	SF_6 GAS
Transformer	Gas Insulated
Control System	Both manual and automation
Communication System	Optical fiber communication
Fault detector	Relays

Features	Specification
Fire Protection System	Auto Fighting Water Spray System
Duration of Project Implementation	Approximately 30 months form the contract signing

Source: PD Office, PGCB

4.6 Brief Description of Proposed Substations and Bay extension Work

4.6.1 Khulshi SS

The existing Khulshi 132kV substation may be upgraded by total replacement of the existing 132kV AIS switching facility with an indoor 7-bay 230kV GIS and a 12-bay 132kV GIS, in a 25mx25m building, and installing new 2x 300MVA, 230/132kV Auto-Transformers outdoor, a new Control room at upstairs and HV cable spread room is to be provided in ground floor. The interconnection between the existing 132 kV AIS and Proposed 132 kV GIS through underground cable should be done one circuit by one circuit in such a way that the each circuit connection can be completed in one day avoiding power shut down of that area more than one day. Otherwise alternative arrangement of power supply should be found out.

The aforesaid proposal was examined. It appears that a space equal to about (50x40)=2000 m2 is required to implement proposed work which is not available at the existing substation premises. So, existing garden area at the south-east corner of the Substation along with the adjacent feeder road has been taken into consideration to accommodate the proposed components (see Appendix-V). A feeder road alternative to the existing one has also been proposed for uninterrupted communication.

4.6.2 New-mooring SS

The selected site is located just beside Abdul Gafur Road (Ananda bazar to Sea Beach road) (N 22˚ 20’ 08” E 091˚ 46’ 01”) under Chattogram Port thana in Chattogram. PGCB will acquire and develop 18 acres land under a separate Project where a 132/33 kV GIS Substation will be constructed and the remaining vacant space will be used in some other purposes. .. In this project a 230/132 kV GIS Substation will be build inside the aforementioned acquired and developed land. It can also be mentioned here that, adequate land will be available for 230/132 kV GIS SS after the construction of 132/33 kV GIS SS. Layout Plan for Proposed New mooring SS is given appendix-V.

4.6.3 Bay extension work of Madhunaghat SS

The existing 132/33 kV AIS substation at Madunaghat, is one of the oldest substations under PGCB. The substation is going to be upgraded into a 230/132/33 kV GIS Substation along with two 230 kV bays and other facilities under a separate project. Two more bays will be needed to connect the substation with the proposed Khulshi 230/132 kV substation through Khulsi to Madunaghat 230 kV underground line which is under the Project. It is to be noted that proposed two bays under this project provision will be constructed inside the 230 kV GIS building which would be previously constructed. Sufficient space would be available inside the substation for the construction work.

4.7 Physical Features of the Transmission Lines

The proposed transmission lines will be a combination of overhead and underground type transmissions. The major physical features of 400 kV overhead TL is given in **Table 4.2**. The transmission line will be double circuit and conductor materials will be made by Aluminum Alloy. The line supporting towers will be steel towers of two types – tension and suspension.

Tension towers will be installed in angles (See **Figure 4.4**) and suspension towers will be installed along the line (See **Figure 4.5**) as load bearing support. The towers will be using disc type porcelain insulators to bear the conductors (See **Figure 4.6**).

Table 4.2: Physical Features of 400 kV Transmission Line

Sl. No.	Physical Features	Attribute
1	Voltage Rating	400 kV
2	Type of Transmission Line	Double circuit
3	Width of T/L Right of Way (RoW)	100 meters (40 m left + 20m DIA + 40 m right)
4	Type of Line Support	400 kV double circuit steel towers
5	Conductor (tentatively)	Quad finch
6	Line Insulator	Disc type, Porcelain
7	Type of Connection	Substations
8	Tentative Number of Towers	56
9	Total land requires for installing a typical Tower	400 m^2 (20mx20m) {per footing area 27.04 m^2 (5.2mx5.2m) }
10	Standard Distance between phase to phase conductors (approx.)	8 m
11	Duration of Project Implementation	Approximately 30 months

Table 4.3: Physical Features of Underground Cable

Sl. No.	Features	Specifications
1	Voltage Rating	400 kV and 230 kV
2	Conductor Size (approx.)	2000 mm^2
3	Diameter of complete cable (approx.)	131 mm
4	Weight of complete cable (approx.)	18 kg/m
5	Cable Insulation Type	XLPE
6	Standard formation of the cable	Trefoil (Triangle)
7	Type of earthling	System neutral effectively grounded

Figure 4.4: Angle Tower

Figure 4.5: Suspension Tower

Figure 4.6: Insulators for transmission line

Figure 4.7 shows drawings of 400kV transmission towers as provided by PGCB. The specifications are for bidding purposes only and PGCB acknowledges that these drawings may be changed by the contractor to better fit the project needs if deemed required.

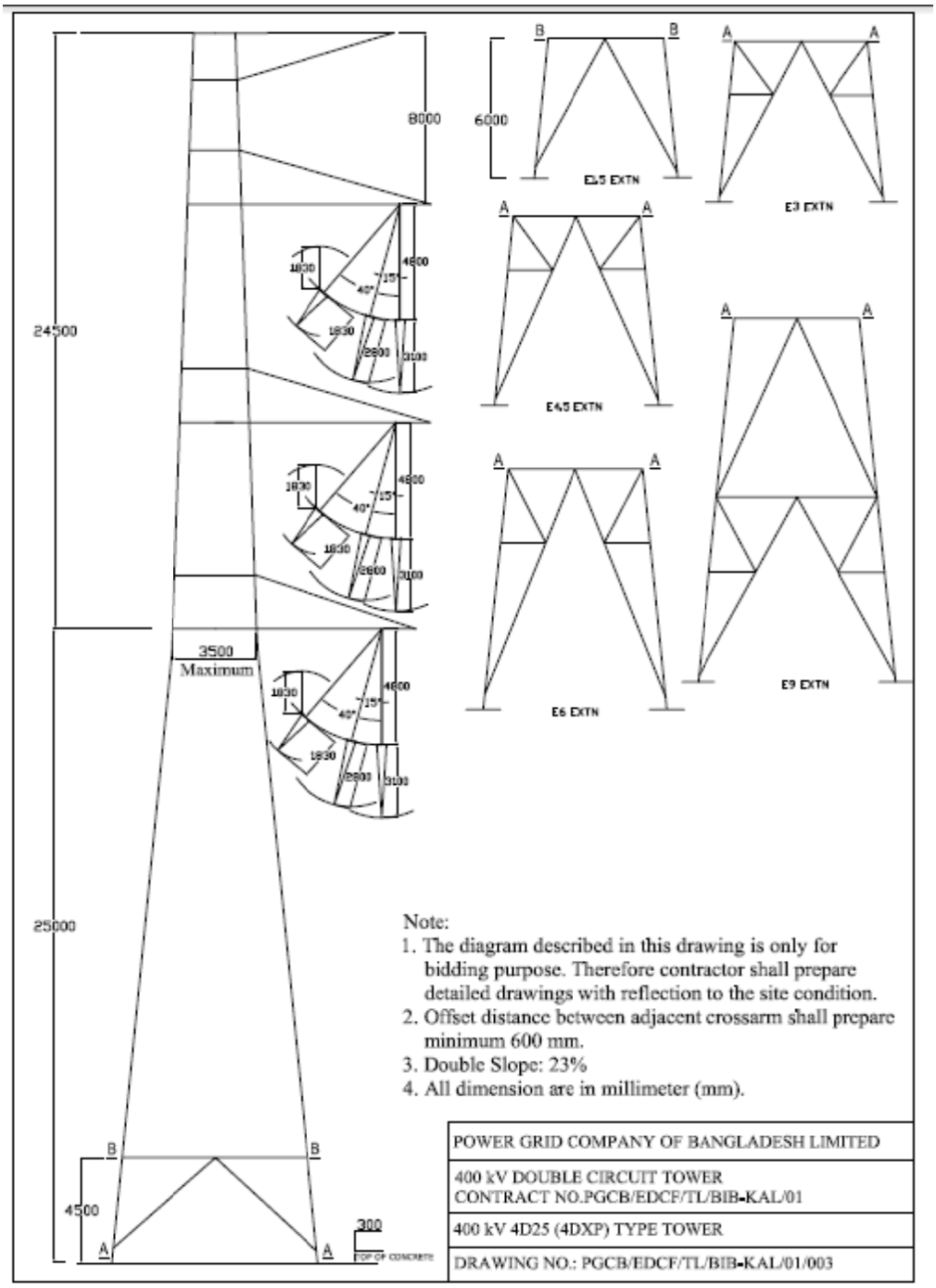


Figure 4.7: Drawings of 400 kV Tower

Figure 4.8 and **Figure 4.9** below show atypical cross-section of an underground cable and underground cables at the existing Khulshi Substation respectively.

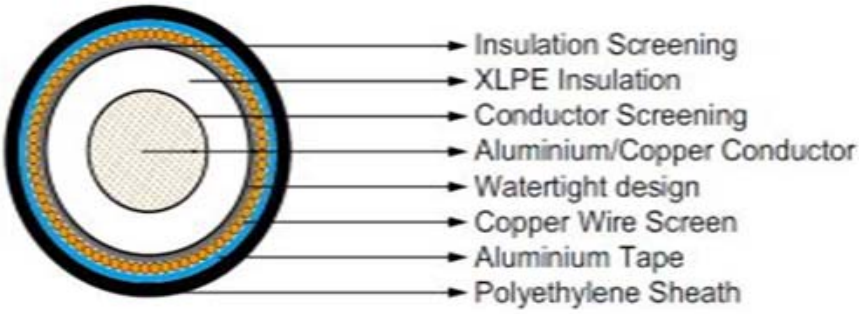


Figure 4.8: Typical Cross-section of Underground Cable

Figure 4.9: Underground Cable at the existing Khulshi Substation

4.8 Construction Works

The activities of the transmission lines and substations are almost similar. The activities to be undertaken include:

4.9 Construction Related works for Transmission Lines

- Plans for around 2.66 km 230 kV LILO constructions
- Plans for around 25.182 km 400 kV transmission line (19.932 km overhead and 5.25 km underground) constructions
- Plans for around 14.56 km 230 kV underground transmission line constructions
- Contractor and worker (manpower) recruitment
- Establishment of construction camps for the workers
- Establishment of temporary access tracks
- Clearing of RoW
- Establishment of material storage areas and work sites
- Transport of materials and equipment to the sites
- Civil works
- Tower erection
- Underground cable trenching
- Conductor stringing and cable laying

4.10 Construction Related works for Substations

- Land acquisition (if required)

- Contractor and worker (manpower) recruitment
- Establishment of construction camps for the workers
- Land development (if required)
- Establishment of temporary access tracks
- Establishment of material storage areas and work sites
- Transport of materials and equipment to the sites
- An upgrade of a substation to be constructed
- An old substation dismantle and upgrade
- Transport of materials and equipment to site
- Civil works
- Equipment installation
- Testing and commissioning of equipment

4.11 Phase-wise Activities of Construction Works

The phase-wise major activities of construction works in transmission line are stated in the Table 4.6.

Table 4.6: Phase-wise Construction Activities

Components	Activities		
	Pre-construction	**During Construction**	**Post Construction/ Operation Period**
Transmission Line	Route Survey	Contractor and manpower recruitment	Clearing of RoW
	Tender Documents preparation	Establishment of construction camps for workers	Operation and Maintenance (O&M)
	Plans for construction activities	Establishment of temporary access tracks	Accidental hazard
		Clearing of RoW	
		Establishment of material storage areas and work sites	
		Transport of materials and equipment to tower site	
		Civil works (foundation works, reinforced cement concrete (RCC)worksetc.)	
		Tower erection	
		Underground cable trenching	
		Overhead conductor stringing	
		Underground Cable laying	
		Accidental hazards	
Substations	Topographical Survey	Contractor and manpower recruitment	
	Land acquisition (if required)	Establishment of construction camps for workers	
	Tender Documents	Land development (if required)	

Components	Activities		
	Pre-construction	During Construction	Post Construction/ Operation Period
	preparation		
	Plans for construction activities	Establishment of temporary access tracks	Operation and Maintenance (O&M)
		Establishment of material storage areas and work sites	Accidental hazard
		Clearing substation site	
		Transport of materials and equipment to substation site	
		Civil works (land filling, foundation works, RCC works etc.)	
		Equipment installation	
		Testing and commissioning	
		Accidental hazard	

Source: ESIA study. CEGIS

4.12 Construction Equipment

All equipment to be installed will be procured from foreign countries for this project. Therefore, use of domestic materials in the project will be less; only local materials such as bricks, sand, cement, rods, etc. will be utilized for installation/ construction works.

4.13 Civil Construction Works

The main activities to be undertaken include:

- Construction and upgrade of substations
- Construction works for underground cable trenching
- Construction of transmission towers

4.14 Construction of Substation

Earth Work in Foundation

Construction of the substation needs earthwork excavating for the foundation up to the required depth. The excavated earth should be kept in a suitable vacant place. After completion of foundation work,back-filling of the excavated area will be done with excavated soil and local sand.

Foundation Treatment

Geo-technical investigation will be conducted to assist in designing foundations of the structures as it will help to identify whether or not foundation treatment would be required. The type of treatment like pre-cast RCC piling or in-situ concrete piling, removal of peat or loose soil will be suggested as per the results of geo-technical investigation. Pilling will be done between 9 to 20 meters depth varying with soil type.

Back Filling with Excavated Soil Local Sand

Back filling of the excavated area of the foundation and floor of the building will be carried out primarily with local sand and compacted excavated soil.

Reinforced Concrete Cement Work

The RCC works will be required for column, beam, floor, equipment foundation structures, steel structures etc.

Brick Work up to Plinth Level and Superstructure

Brickwork will be done for the construction of substation buildings with first class bricks, coarse sand and cement up to roof level.

Figure 4.10: Sand Filling

Figure 4.11: Pilling Work

Plastering and Finishing

Plastering of walls inside and outside as well as the roof of the building will be done in accordance with proper curing for at least three weeks. Following that, distemper or plastic painting will be applied on the walls and roof of the buildings.

Wood Works/ Thai Aluminum, Windows and Glass Fittings

Wood/Thai aluminum works are to be done on door shutters and windows of the building along with glass fittings.

Sanitary Works

Sanitary works such as lying of sewerage line of either polyvinyl chloride (PVC) or RCC, installations, fittings and fixtures of toilet accessories will be done in the buildings.

Water Supply System

The water supply system, where available, will be activated for the staff and the workers of the substation site during and after the construction. Tube -wells will be set up where there is no water supply system.

Boundary Fencing with Concrete Pillar and Barbed Wire

The substation areaswill be protected from any unauthorized entrance of public by fencing the boundary using six feet highwallshavingconcrete pillars three meters apartwith barbed wire fitted on top.

4.15 Construction Work for Underground Cable Trenching

The underground cable along the road way is usually done by open trench method which will be applied for this project. The process below is applicable for two circuits.

Trench Cutting

The trench wills be1.2m wide and 1.7m deep. As practiced normally, the wearing surface of the road will be cut along the trench line by diamond cutter. After removing the wearing layer, an excavator will be used to dig up soil up to the required depth. No retaining wall would be required for this process.

Figure 4.12: Ongoing 132 kV cable trenching work at Chattogram

RC Trench Side Installation

Interlocking reinforced cement (RC)trench blocks will beplaced at the bottom of the trench vertically. The height of the trench blocks will beabout 350mm. Fine graded soil will beplaced onthe trench bed.

Laying of Cables

Two circuits of power cableswill beplaced over the sand bed. These are normally trefoil. The parallel distance betweenthe circuits is700mm. Optical fiber cables are placed along the centerline of the trench.

Concrete Casting and Backfilling

A sand layer will beplaced with clearance height of 200mm of the cables. RC covers will beplaced over the sand layer. A layer of 300mm of soil is placed over it. A yellow tape is placed over this soil layer. Finally, the rest of the space is backfilled with specified material.

4.16 Civil Works for Transmission Tower

Piling Work

The basement of lattice towers will be pile foundation. There will be piles and at the top, a pile cap in each leg of the tower. For piling work, a boring will be made in the soil using drilling rig. Bentonite slurry or steel tube will be used to stabilize the bore holes. Reinforcement cage will be placed and consequent concrete casting will be performed. For pile foundation, at least threepiles and mostlyfourpiles are cast in general. The number and depth of pile will depend on the results of geo-technical investigation.

Excavation

After the completion of piling work, the top soil of the piles will be excavated up to specified depth. The excavation work could be done using local instrument or using excavator.

Pile Cap Casting

At the finishing of excavation, top and bottom reinforcements will be placed. Then concreting of pile cap will be performed. The pile cap transfer load to the sub soil through the piles.

Tower Erection

The steel sections of the tower will be joined by bolt to erect the tower. Crane may be used to lift the steel sections at different elevation.

Figure 4.13: Placing steel ring bunds

Figure 4.14: Welding of reinforcements

Figure 4.15: Tower pilling work

Figure 4.16: Pile cap reinforcement

Figure 4.17: Striping the tower footing with steel

Figure 4.18: Providing detail reinforcements

Figure 4.19: Casting concrete cement into tower foundation

Figure 4.20: Placing tower on its foundation

4.17 Electrical Works

Installation of equipment will include circuit breakers, transformers, lightning arresters, panel boards, batteries and battery chargers, insulators, current transformers, potential transformers, relaysetc. After completion of the building, all equipment will be installed at the substation as per design specification and standard. For this project, all substation materials will be procured from foreign countries. Therefore, use of domestic materials will be less; only local materials like bricks, sand, cement, rods etc. will be used for the installation works.

Transformers are heavy equipment. Therefore, the transportation of such equipment may require grading of river embankment and skidding through open field. Compensation may be provided to the land owners who would be affected.

4.18 Erection of Tower

The towers will be constructed to take the load of the tower itself, conductors, accessories as well as wind load and earthquake load. The towers in paddy fields will have proper clearance

to maintain sag (lowest point on line). At homesteads, if any, the sag will be maintained as per standards.

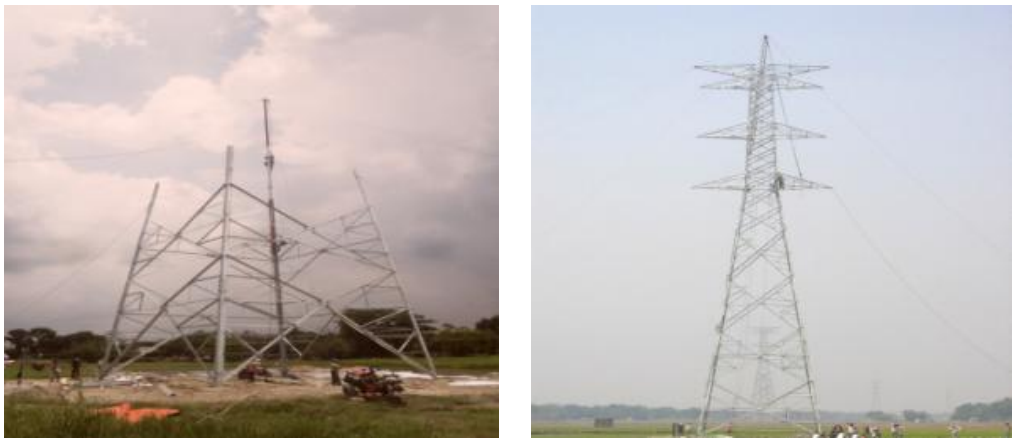


Figure4.21: Tower erection works

4.19 Drawing of Transmission Line

The transmission line will be drawn keeping suitable clearance (as per design) at all locations. During stringing work, the lowest sag point will be maintained as per the approved drawing and design following appropriate safety precautions and standards.Generally, tension stringing method is used for conductor stringing in Bangladesh. A pulling line is initially pulled into the travelers which is then used to pullthe conductor from the reel stands using specially designed tensioners andpullers. This process is almost similar in overland and river crossing portion. If the span of the river crossing portion is large, than a water vichle is used to carry the puller through the river.

Figure 4.22: Conductor stringing

4.20 Testing and Commissioning of Equipment

After installation of all the indoorand outdoor equipment, each and every equipment will be tested as per specification and standard. If all the tests are successful, the substations will be commissioned accordingly.

4.21 **Grounding of Equipment**

After installation, proper grounding of all instruments and line will be done. It is necessary for safe working place.

4.22 **Construction Waste and Hazardous Materials Disposal**

Hazardous materials and waste produced during construction works need proper storage, handling, in accordance with local regulations. In order to ensure the proper management of these materials, a certain place within the project boundary will beselected where the materials would bedeposited temporarily and then moved within theshortest possible time. Basically, the dumping zone will beselected near the boundary line where the main project entrance would belocated for easy transport of these materials away from the site. Dumping site near the entrance assures easy loading and unloading of those disposed materials into the disposal carrying vehicles. In case of the project boundary beingcomparatively small and therefore,not having the available space for waste disposal, then disposal site should be selected beside the project location with the approval of the appropriate authority.

4.23 **Reinstating the Site**

The embankments and other areas around the fence lines will be reinstated where necessary.

4.24 **Maintaining the Substation**

The substation sites will be kept tidy at all times. Maintenance of the substation is essential for ensuring substation reliability and safety. An annual review is generally conducted and maintenance is carried out as required. The life of a substation is about 40 to 50 years. Replacement and refurbishment work may need to be done from time-to-time. This may be as simple as replacing some aging equipment over several days or weeks, or rebuilding certain sections of the substation which could take several months. Maintenance work can be classified as daily, weekly and yearly maintenance. Transmission lines and substation equipment like transformers with associated bay equipment, bus bar coupler, capacitor banks, battery and battery chargers, relays, underground cable etc. need to be regularly monitored and maintained after substation commissioning. Measurement of leakageinline current and neutral current of transmission lines, air cooler servicing and maintenance, refilling and maintenance of firefighting equipment, gardening, plantations, water supply and sanitation etc. are also considered necessary for sound operation of substation.

At times, it mayrequireto work beyond the normal working hours to carryout essential maintenance or responding to an emergency.

4.25 **Work Schedule**

The completion of works will take approximately 30 months from January 2019 to June 2022 (Source: PDPP, PGCB, 2016).

4.26 **Estimated Cost of the Project**

The estimated cost of the Project is stated below in Table 4.7.

Table 4.7: Estimated Project Cost

Funding	Lac[1] BDT[2]	Million USD[3]
Government of Bangladesh (GoB)	38,853.89	463.93
Power Grid Company of Bangladesh Limited (PGCB)	8,747.16	104.44
Project Aid (PA)	100,149.27	1195.81
Total	147,750.32	1764.18

[1]Lac = 0.1 Million, [2]BDT = Bangladesh Taka (Local Currency)
[3]Exchange Rate: 1 USD (United States Dollar)= BDT 83.75 as on July 3, 2018 (Bangladesh Bank)
Source: DPP, PGCB, October 2018

5. Analysis of Alternatives

5.1 Introduction

Alternatives analysis is an analytical comparison of the operational effectiveness and suitability of the alternative solutions. It focuses on identification and analysis of alternatives, measures of effectiveness and the overall risks. Alternatives in environmental studies can be analyzed and compared in term of 'No Action' option with the proposed 'Action Option(s)'. No action option defines the scenario of the present situation. Itillustratesthe present scenariowithout any interventions.The proposed power system development projectis essential to strengthen the existing grid network and tofulfil thefuture power demand of the port city of Chattagram. The sites for the substations and the routes for the transmission lineshave been selected based on several criteria including environmental implications.

5.2 Alternative Analysis for Substations Upgrade/ Bay Extensions

5.2.1 132/33kV New Mooring Substation Upgrade to 230/132kV GIS in the Same Location

New Mooring: Option-0

The first option labeled as 'Option-0'is a 'No Action' scenario. The 'No Action' scenario means that no upgrade to a Gas Insulated Switchgear (GIS) based 230/132kV substation of the'to be constructed'132/33kV substation (the 132/33kV substation is part of another project) at New Mooring.With this option, it would mean no power system growth of the Chattagram area and a significant portion of the area will continue to starve from lack of electrification resulting on low living standard and extremely slow economic growth.

New Mooring:Option-1

The second option, labelled as 'Option-1' is an 'Action Option' which is theconstruction of a new Gas Insulated Switchgear (GIS) based 230/132kV substationinside the 18 acre acquiredland for the construction of a132/33kV substation by PGCB, the latter being the part of another project. The site islocated just beside Abdul Gafur Road (Anandabazar to Sea Beach road) (N 22˚ 20' 08" E 091˚ 46' 01").

Figure5.1: Current scenario of New Mooring: Option-1

Comparative analysis matrix for the upgrade of New Mooringsubstation is given in Table 5.1 below.

Table 5.1: Comparative Analysis of the Substation Upgrade Plan at New Mooring

Condering Factors	New Mooring: Option-0	New Mooring: Option-1
Meet Present Demand	Somewhat	Yes
Power System Growth	No	Yes
Satiate Future Demand	No	Yes
Implementation Expense	None	Medium-High

Environmental burden bore by the two alternatives are given below in Table 5.2.

Table 5.2: Comparative Analysis from the Environmental Perspective of the New Mooring Upgrade Work

Considering Factors	Option-0	Option-1
Air Quality	None	Moderate deterioration during construction activities due to release of SPM in the air, particularly during levelling and clearing; no impact during operations and maintenance; air quality is expected to gradually return to baseline condition at post construction;
Water Quality	None	Very low deterioration during construction activities; low impact during operation and maintenance while managing site generated wastes etc.;
Soil Quality	None	Slight deterioration during construction activities due to excavation and piling works; no impact during operations and maintenance;
Noise Level	None	Moderate deterioration during construction activities due to movement of heavy vehicle and

Considering Factors	Option-0	Option-1
		machineries; low impact during operation and maintenance; noise level is to become slightly higher than baseline conditions but expected to be within the national standard; the only notable source of noise will be back-up generators and cooling fans.

New Mooring Conclusion

Based on the discussions above, while there are some implications of environmental burden primarily during the construction phase, most of the impacts are acceptable for a project of such stature. However, the impacts are not significant enough to rebuttal the need for power system expansion in the region which carries a lot of socio-economic positive implications and hence, the 230kV substation in New Mooring under this project should have a green light in the selected area (New Mooring: Option-1).

Recommendation: New Mooring Option-1.

Figure5.2: Google Map New Mooring: Option 1

5.2.2 132/33kV Existing AIS Khulshi Substation'sStep by Step Upgrade to GIS based 230/132kV in an Adjacent Location

Khulshi: Option-0

This option is a non-intervening option i.e. 'No Action' option and labelled as 'Option-0'.The existing Air Insulated Switchgear (AIS) based 132/33KV substation will not be dismantled and upgraded to a GIS based 230/132kV substation at Khulshi under this Project.With this option, it would also mean that there will be no power system growth of the Chattagram area.A good portion of the area will continue to be deprived ofadequate supply of electricity.This will not help the low living standard presently experiencedin many parts of this area. The economic growth will be extremely slow as well.

Khulshi: Option-1

This is one of the three (03)'Action' options and has been labelled as 'Option-1'. The existing Khushi substation will be upgraded to a 230kV substation in step by step manner with as much as little interruption as possible. The first location is labeled as Option-1. This place is situated beside the existing substation (N 22° 11' 42" E 091° 47' 46"). The land belongs to Bangladesh Power Development Board (BPDB). The available land is fully covered by thicket. So, ecological eco-system may be hampered. Besides, land filling will berequired. This area also require a lot of clearing works.The existing towers are located in places from where those tower willhaveto be relocatedin order to build the upgraded substation.

Figure5.3:Khulshi Option-1

Khulshi: Option-2

This is the second 'action' option out of three and labelled as 'Option-2'. In Khulshi, there is already a 132kV substation.The ideal place for the new substation would be the front side of land area which is a flower garden owned and managed by PGCB.The flower garden was originally created by PGCB authority in the empty spaceas an ornament inside the site. Underneath this garden, there are two 33kV lines that runs through the middle.There are alsounderground cables that are placed along the perimeter of this garden. If this site is chosen,the existing underground cables shall haveto be relocated. The newly proposed 230kV substation will be built primarily in a three storied building with a control room, GIS based switchyards and switchyard cables all indoor, only the step transformers being placed outdoor.

Figure5.4:Khulshi Option-2

Khulshi:Option-3

This is the second of the three 'Action' options and labelled as 'Option-3'. The proposed substation will bebeside the BPDB wireless tower (GPS- N 22˚ 21' 46" E 091˚ 47' 44"). This land belongs to BPDB. The land is completely fallow landadjacent to a hillock. As a result, excavation cost will be very high.

Figure5.5:Khulshi:Option-3

Comparative analysis matrix for Khulshi SS sites are given in **Table 5.3**.

Table 5.3: Comparative Analysis of Substation Site Selection at Khulshi

Considering Factors	Khulshi: Option-0	Khulshi: Option-1	Khulshi: Option-2	Khulshi: Option-3
Location	Khulshi	Khulshi	Khulshi	Khulshi
GPS	N/A	22°21'42.01"N 91°47'47.09"E	22°21'41.73"N 91°47'45.13"E	22°21'49.35"N 91°47'47.96"E
Land Use	None	Fallow land	Unusedarea and flower garden	Fallow land
RAP Necessitate	No	Yes	No	Yes
Road Condition	N/A	Very Good	Very Good	Very Good
Nearby Water Body	N/A	No	No	No
TL shifting Required	N/A	Yes (Khulshi to Madunaghat 132kV TL 02)	Yes 33 kV underground cable stadium to Khulshi	Yes (Khulshi to Madunaghat 132kV TL 01)
Availability of land	N/A	Yes	Yes	Yes

Considering Factors	Khulshi: Option-0	Khulshi: Option-1	Khulshi: Option-2	Khulshi: Option-3
Land leveling work	N/A	Medium	Low	High
Height of required land filling	N/A	N/A	N/A	N/A
Scope of future Expansion	Yes	No	No	No
Land ownership	N/A	BPDB	PGCB	BPDB
Complexity Level of Acquisition	N/A	High	N/A	High
Meet Present Demand	Somewhat	Yes	Yes	Yes
Power System Growth	No	Yes	Yes	Yes
Satiate Future Demand	No	Yes	Yes	Yes
Implementation Expense	None	High	Medium-High	High

Source: ESIA Study, June 2018, CEGIS

Table 5.4: Comparative Analysis of Substation Site Selection at New Mooring

Considering Factors	Khulshi: Option-0	Khulshi: Option-1	Khulshi: Option-2	Khulshi: Option-3
Air Quality	None	Medium deterioration during construction activities due to use of heavy trucks for land management; no impact during operations and maintenance;	Slight deterioration during construction activities; no impact during operations and maintenance;	High deterioration during construction activities due to use of heavy trucks for land management as the soil in this area is primarily dry soil which may lead to SPM in the air; no impact during operations and maintenance;
Water Quality	None	No deterioration during	Slightdeterioration during construction	No deterioration during

		constructio n activities as there are no water body adjacent to the site; low impact during operation and maintenan ce due to operational wastes;	activities as part of this land is adjacent to the natural and man-built drainage system of the nearby existing substation; low impact during operation and maintenance;	constructio n activities;v ery low impact during operation and maintenan ce;
Soil Quality	None	Moderate amount of land clearing land clearing and levelling work will lead to change in soil quality; no impact during operations and maintenan ce;	Very low level of deterioration during construction activities; no impact during operations and maintenance;	Slight deteriorati on during constructio n activities; no impact during operations and maintenan ce;
Noise Level	None	Very high level of deterioratio n during constructio n activities as a lot of clearing will require using heavy trucks and equipment; low impact during operation and maintenan ce; primary sources of noise will be cooling	Moderate deterioration during construction activities; low impact during operation and maintenance; primary sources of noise will be cooling fans and back-up generators (if any);	Very high deteriorati on during constructio n activities due to levelling of uneven land; low impact during operation and maintenan ce; primary sources of noise will be cooling fans and back-up generators

		fans and back-up generators (if any);		(if any);

KhulshiConclusion

Comparing the action options, i.e. Option-1, Option-2 and Option-3, it is evident that Option-2 is the most easily implementable from perspectives of land acquisition, RAP process, environmental bearing etc. Hence, Option-2 is considered to compare with 'No Action' alternative i.e. Option-0.

Considering the socio-economic influence this new 230kV substationwill bring, which will significantly boost the power system scenario in the Chattagram region, the minor negative environmental bearings primarily during the construction phase can be justified. Needless to say, once the construction period is over, the environmental bearings are expected to be well within the allowed limit for a project of similar features. The socio-economic long term benefitsoutweighs the short-term environmental bearings. As such, the action option 'Option-2' should be given the importance over no action option 'Option-0'.

Recommendation: KhulshiOption-2.

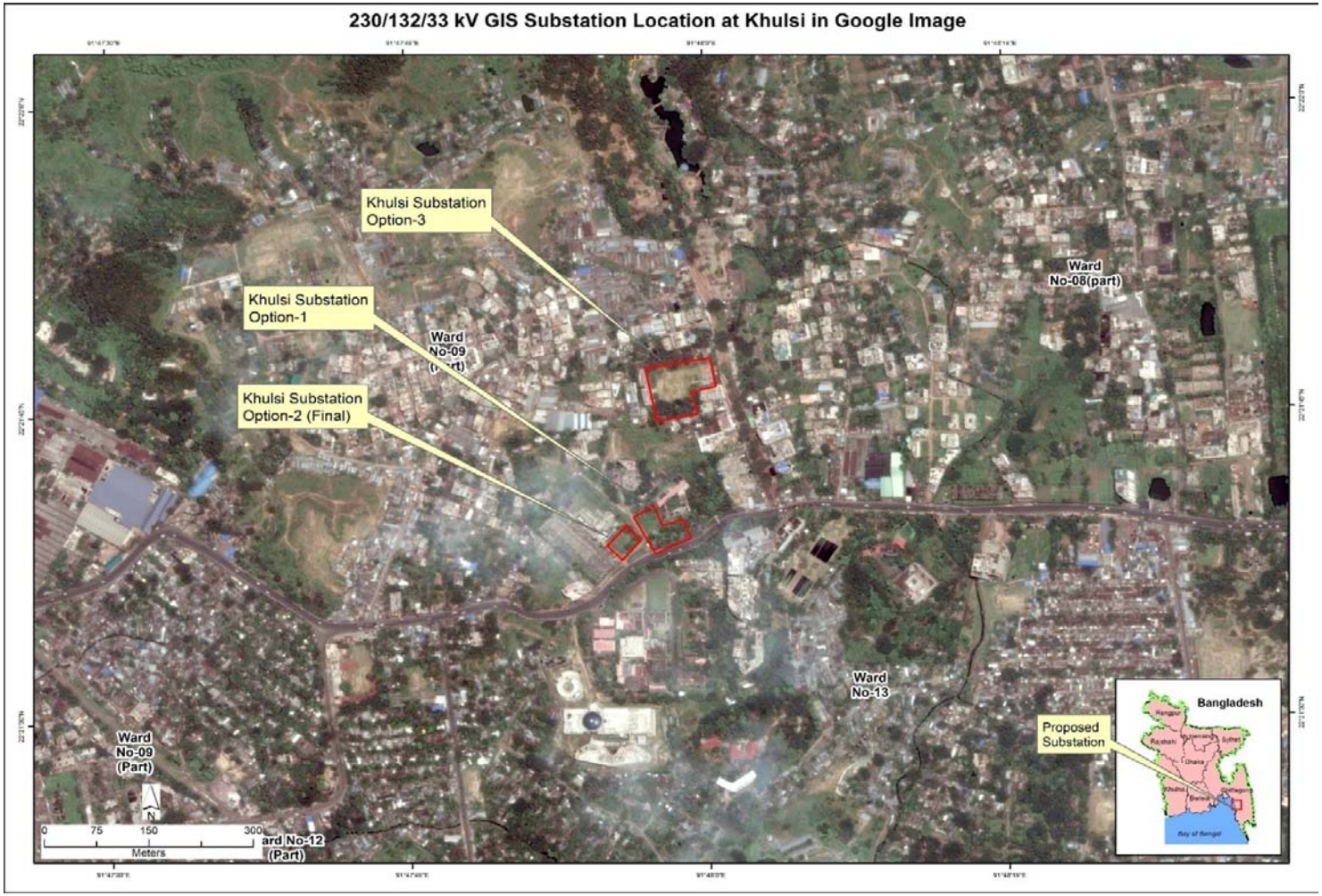


Figure 5.6: Google Map showing location of the options atKhulshi

5.3 Alternative Transmission Line Routes

The following criteria were considered for selecting the alignment of the routes:

- Existence of open agricultural land;
- Distance from connecting road not to be more than 1 km;
- Avoiding settlement areas as much as possible;
- Avoiding urban areas as much as possible;
- Avoiding river crossings;
- Avoiding water bodies;
- Considering the existing power distribution line;
- Location of Air-Insulated Switchgear (AIS) and Gas-Insulated (GIS) substation;

Transmission line route and substation options have also been physically observed during field visit. Three alternatives transmission line routes are considered (Option-1, Option-2 and Option-3) for the proposed new lines. The options were selected through consultation with local stakeholders, analyzing of maps and underground utilities, satellite images, traffic condition etc. to minimize impacts from previous RoW. From field findings, it is obvious that every transmission line routes would have some limitations and opportunities. After detailed route survey most suitable route for the proposed transmission line has been selected so that it will create less impact on physical and social environment as well as underground utilities facilities (gas, water, etc.), traffic condition etc.

With the 'No Action' options under the transmission lines development components of this project, those termed as Option-0 in the subsequent sections, it would mean no power system growth of the Chattagram area and a significant portion of the area will continue to starve from lack of electrification resulting in low living standard and extremely slow economic growth in the near future. It would mean that even though there will be power supply readily available to be provided to the people of Chattagram area, no infrastructure would essentially mean the power cannot be transferred.

5.4 Alternative RoutesbetweenMadunaghat and Khulshi

Comparative analysis matrix of Madunaghat-Khulshiis given in **Table 5.4.**

Table 5.4: Comparative Analysis of Options for Proposed Madunaghat-Khulshi Underground Transmission Lines from Technical Perspective

Factors Behind Route Selection	Option-1	Option-2	Option-3	Option-4
Considering Length	0m	13.06km	14.6km	15.21km
Impact on Settlement	N/A	No	No	No
Difficulty of Implementation w.r.t. trenching/ excavations	N/A	High	Medium	High
Crossing of any other existing or proposed Transmission line	N/A	Yes 1) 33 kV underground cable stadium to Khulshi 2) 132kV	Yes 1) 33 kV underground cable stadium to Khulshi 2) 132kV	Yes 33 kV underground cable stadium to Khulshi

Factors Behind Route Selection	Option-1	Option-2	Option-3	Option-4
		Madunaghat to Kalurghat T/L	Madunaghat to Kalurghat T/L	
Existing Important Infrastructure	N/A	No	No	No
Tentative Number of the Towers	N/A	N/A	N/A	N/A
Meet Present Demand	No	Yes	Yes	Yes
Power System Growth	No	Yes	Yes	Yes
Satiate Future Demand	No	Yes	Yes	Yes
Implementation Expense	None	High	Moderately High	High

Source: ESIA Study, CEGIS

Table 5.5: Comparative Analysis of Options for Proposed Madunaghat-Khulshi Underground Transmission Lines from Environmental Perspective

Factors Behind Route Selection	Option-1	Option-2	Option-3	Option-4
Considering River Crossing (width of rivers)				
River	N/A	No	No	No
Reserve Forest	N/A	No	No	No
Ecologically Critical Area (ECA)	N/A	No	No	No
Bird Habitat and Declared IBA	N/A	No	No	No
River Erosion	N/A	N/A	N/A	N/A

Source: ESIA Study, CEGIS

Conclusion: Based on the route survey, it is identified that Option-3 will have the least difficulty with respect to excavation and trenching related activities due to its alignment and location of nearby structures. As such, Option-3has been selected for Madunaghat-Khushi230kV underground transmission line.

The socio-economic benefits due to the implementation of this transmission line far outweigh the limited environmental bearings, which are common for any similar infrastructure development. Besides, the alignment is free of ECA, IBA etc. Thus, Option-3 is recommended over 'No Action' option Option-0.

The map of the selected route of Madunaghat-Khulshiis given in Figure 5.10below.

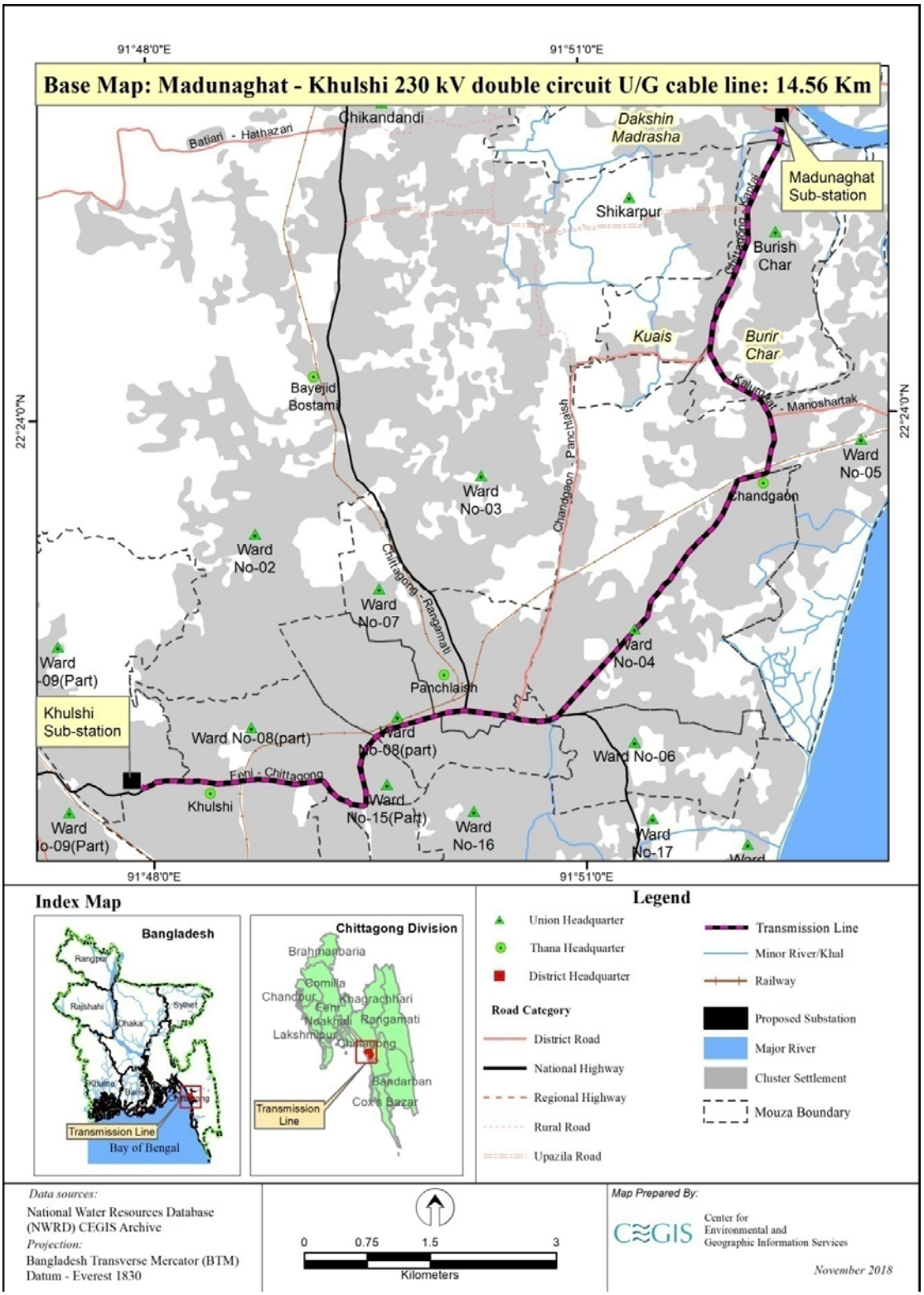


Figure5.10: Base Map of Madunaghat-Khulshi 230 kV double circuit TL

5.5 Alternative Routes betweenAnowara and Anandabazar (New mooring)

Comparative analysis matrix of Anowara-Anandabazar (New Mooring) are given in Table 5.6. Table 5.6: Comparative Analysis of Options for Proposed Anowara-New mooring, transmission lines from Technical Perspective

Factors behind route selection	Option-1	Option-2 (Final)	Option-3	Option-4
Considering Length	0m	Total 25.600 km (Overhead 19.347km and Underground 5.253km)	Total 24.351 km (Overhead 19.098km and Underground 5.253km)	Total 30.096 km (Overhead 19.390km and Underground 10.706km)
Impact on Settlement	N/A	Yes, but relatively less compared to Option 3 and 4.	Yes, but relatively high compared to Option 3.	Yes and the highest amongst the 'action' options.
Difficulty of Implementation w.r.t. trenching/ excavations	N/A	Medium	Medium	High
Crossing of any other existing or proposed Transmission line	N/A	Yes a. Shahmirpur -Julda 132kV T/L b. Sikalbaha-Shahmirpur 132kV	Yes a. Shahmirpur-Julda 132kV T/L b. Sikalbaha-Shahmirpur 132kV	Yes a. Shahmirpur-Julda 132kV T/L b. Sikalbaha-Shahmirpur 132kV c. AnowaraSikalbha 230kV T/L
Existing important infrastructure	N/A	KAFKO	NO	KAFKO
Angle Point	N/A	15	10	10
Tentative Number of the Towers (for overhead TL)	N/A	60	59	60
Meet Present Demand	No	Yes	Yes	Yes
Power Growth	No	High	High	Very High
Satiate Future Demand	No	Yes	Yes	Yes
Implementation Expense	None	High	High	Very High

Source: ESIA Study, CEGIS

Table 5.7: Comparative Analysis of Options for Proposed Anowara-New mooring, transmission linesfrom Environmental Perspective

Factors behind route selection	Option-1	Option-2 (Final)	Option-3	Option-4
Considering River crossing (width of rivers)				
Karnafuli River	N/A	643.39m	643.39m	833.22m
Reserve forest	N/A	No	No	No
Ecologically Critical Area (ECA)	N/A	No	No	No
Bird habitat and declared IBA	N/A	No	No	No
River erosion	N/A	No	No	No

Source: ESIA Study, CEGIS

Conclusion: Anowara-Anandabazar (New Mooring)

Based on the route survey, it is identified that Option-2 will have the least difficulty with respect to excavation and trenching related activities in terms of total underground length in comparison to Option-4. At the same time, Option-2 also will have lower impact on settlement compared to Option-3. As such, Option-2 has been selected for Anowara-Anandabazar (New Mooring)230kV underground transmission line.

The socio-economic benefits due to the implementation of this transmission line far outweigh the limited environmental bearings, which are common for any similar infrastructure development. Besides, the alignment is free of ECA, IBA etc. Thus, Option-2 is recommended over 'No Action' option Option-0.

The mapof the selected route of Anowara-Anandabazar (New Mooring)is given in Figure 5.11below.

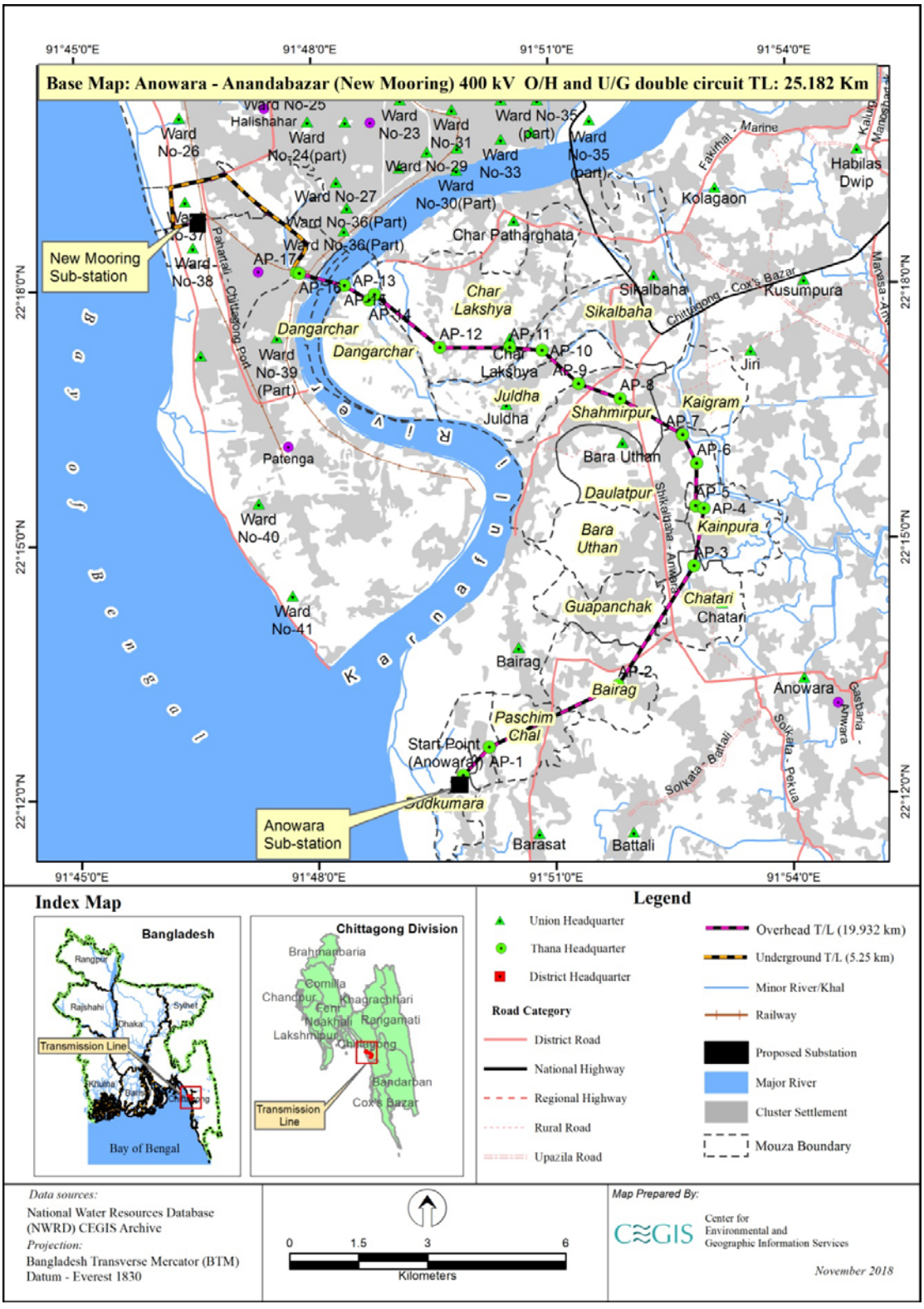


Figure5.11: Base Map of Anowara-New Mooring 230 kV double Circuit TL

Proposed New Mooring- Anowara transmission line will cover Halishahar, Julda and Dagar char area. On the other hand, Khulshi-Madunaghat underground line will cross through GEC circle, Muradpur, 2 no. gate, Bahaddarhat, CaptaiRastarmatha, etc. areas at Chattogram.

Based on the comparative analysis, the option of final alignment for all the areas is found to be the most suitable. Heavy equipment may easily be transported to the location with minimum disturbance to the host community and having no important site being affected. Good communication to the proposed transmission line will allow immediate completion of the project.

5.6 Alternative Routes from Hathazari to Rampur

There has been no alternative routes for the 2.66 km long 230kV line-in-line-out (LILO) underground double circuit transmission line betweenHathazariand-Rampur.

Table 5.9: Comparative Analysis of Options for Proposed Hathazari-Rampur LILODouble Circuit Transmission Linesfrom Technical Perspective

Factors behind route selection	Option-0	Option-1 (Final)
Considering Length	0m	2.66km underground
Impact on settlement	N/A	No
Crossing of any other existing or proposed Transmission line	N/A	N/A
Existing important infrastructure	N/A	N/A
Angle Point	N/A	N/A
Tentative Number of the Towers (for overhead TL)	N/A	None
Meet Present Demand	No	Yes
Power Growth	No	Yes
Satiate Future Demand	No	Yes
Implementation Expense	None	Medium

Source: ESIA Study, CEGIS

Table 5.10: Comparative Analysis of Options for Proposed Hathazari-Rampur LILO Double Circuit Transmission Lines from Environmental Perspective

Factors behind route selection	Option-0	Option-1 (Final)
Considering River crossing (width of rivers)		

Factors behind route selection	Option-0	Option-1 (Final)
River	No	No
Reserve forest	N/A	N/A
Ecologically Critical Area (ECA)	N/A	N/A
Bird habitat and declared IBA	N/A	N/A
River erosion	N/A	N/A

Source: ESIA Study, CEGIS

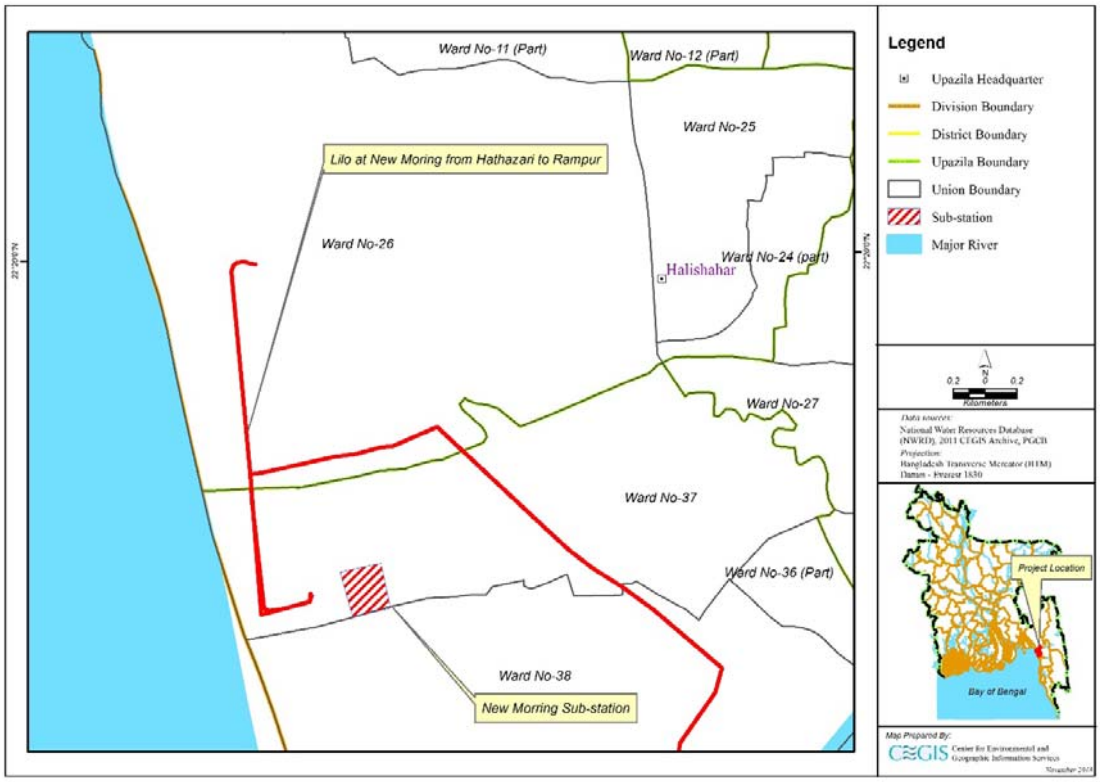


Figure 5.12: Base Map of Hathazari-Rampur LILO 230 kV Double Circuit TL

Conclusion: Hathazari-Rampur LILO

The socio-economic benefits due to the implementation of this transmission line far outweighs the limited environmental bearings which are common for any similar infrastructure development. Besides, the alignment is free of ECA, IBA etc. Thus, Option-1 is recommended over 'No Action' option Option-0.

6. Analysis of Associated Facilities

6.1 Introduction

According to AIIB Environmental and Social Framework (ESF)[10] "Associated facilities (Associated Facilities) are activities that are not included in the description of the Project set out in the agreement governing the Project, but that the Bank determines, following consultation with the Client, are: (a) directly and materially related to the Project; (b) carried out or planned to be carried out, contemporaneously with the Project; and (c) necessary for the Project to be viable and would not be constructed or expanded if the Project did not exist." The associated facilities for this project include Anowara GIS substation, which is connected to the transmission lines proposed in this project.

6.2 Anowara GIS Substation

The proposed Anowara 230/132/33 kV GIS Substation (Future provision for 400 kV SS) is going to be constructed at Barasat union under Anowara Upazila in Chattogram district. About 20 Acre land will be acquired to install the proposed Substation. The land is mainly private where agricultural activities are carried out. Most of the land cultivation is three cropped and the rest of the land is two cropped. As a result, land and crop compensation is mandatory. This area was affected by flood back in 1991. There is no water logging problem in this land. In rainy season if heavy rainfall occurs, water logging duration is maximum three days. Communication facility is sound as the site is situated beside main road. Moreover, local labor is available in that area.

The Substations have electrical specifications for voltage, switchgear, circuit breaker, transformer, and protection systems. The key physical features of the substations are given in Table 6.1.

[10] Published in February 2016, Page no. 15

Table 6.1: Physical Features of the Anowara 230/132/33 kV Switching GIS SS

Features	Specification
Type	Proposed
Land ownership	20 acre land acquired by PGCB
Type	GIS (Indoor)
MVA	2X350/450 MVA (230/132 kV level) 2X80/120 MVA (132/33 kV level)
Voltage level	230/132/33 kV
Insulation Medium Power Circuit Breaker	SF6 GAS
Transformer	Gas insulated
Control System	Both manual and automation
Communication System	Optical fiber communication
Fault detector	Relays
Fire Protection System	Auto fighting water spray System
Duration of Project Implementation	Approximately 30 months form the contact signing.

6.3 Baseline

6.4 Water Availability

Surface Water

Chattogram is both a hilly and a coastal district. Surface water is available from spring, river lakes, ponds and especially from sea. Major surface water bodies are the Bay of Bengal, Sangu, Karnafuli, Bakkhali, Koholia, and Meghna. The proposed Anwara substation is located beside the Parki beach.

Ground Water

Ground water is easily available in most of the project areas. Salinity is a main issue in Anwara Upazilla according to local people.

Drainage Congestion

Low agricultural land has been selected for proposed substation site at Anwara. In monsoon, the land proposed for substations are inundated with approximate 2 to 3 feet depth. It takes not more than 3 days to drain out the excess rain water from land through the khal in front of the proposed substation.

6.5 Environmental Quality

Data on air quality, water quality and noise level was collected to assess the environmental quality at baseline condition which is discussed in the following sections.

6.6 Noise Quality

The standard values for noise as per Environmental Conservation Rules of Bangladesh are shown in **Table 6.2.**

Table 6.2. Standard Value (dBA)

Category	Categories	Standard Value (dBA)	
		Day	Night
A	Quiet place (hospitals, education institutions, etc.)	45	35
B	Areas used mainly as residential purpose	50	40
C	Areas used as residential and commercial purposes	60	50
D	Commercial	70	60
E	Industry	75	70

Source: Environmental Conservation Rules, 1997, DoE

As the transmission lines will cross mainly agricultural lands (open spaces) and Main town road, the standard value for ambient noise should be below 60 dBA.**Table 6.3** shows the noise levels of some locations in the study area and found within the standard. However, details of noise quality would be carried out in the major field investigation to be conducted during ESIA.

Table 6.3: Noise Level of Anowara Substation

Sl. No.	Date and Time	Location	GPS Coordinate	Noise Level (dBA)
01	18.04.17 04:32pm	Anowara Proposed substation	N 22° 12' 22" E 91° 49' 35"	47

Source: CEGIS Study'2017

6.7 Agricultural Resources

The Anowara substation will require 8.09 ha land. The proposed land is an agricultural land where almost half of the land is three cropped. The only cropping pattern of this site is HYV Aus-HYV Aman-HYV Boro. During Kharif-I HYV Aus is grown in almost half of the land.

HYV Aman covers the entire land in Kharif-II while some portion remains uncultivated during Rabi season when HYV Boro is the only crop. Therefore cropping intensity of this area is 250%.

Total 70 tons rice is produced in this area of which Aus, Aman and Boro production is 18 metric tons, 24 metric tons and 28 metric tons respectively.

6.8 Ecological Resources

The proposed substation site is purely an agricultural land using for cultivation of different rice varieties. Periphery of the area is belonging Indian Coral Tree, Shialmutra as well as Common Duckweed. In addition, a bunch of Arum is also present in the project area. Of the fauna, Black Drongo, Indian Pond Heron and Blue-eared Kingfisher have recorded as common species. An ecological view of the proposed substation (20 acres) is presented in **Figure 6.1** below.

Figure 6.1: Ecological view of the project area at Anowara

6.9 Socio-economic Resources

Anowara 230/132/330 kV GIS Substation of PGCB will be constructed on private land in Barasat union. The Substation requires 20.0 acres of land for its implementation in Dudkumar mauza in the Project area. These 20 acres of land consist of 181 parcels of land including 3 (three) organizational land ownerships, which are community land for mosque (no structure) Government Khas Land and Bangladesh Water Development Board land.

Table 6.4: Amount of Land to be acquired for Substation Implementation

Upazila	Union	Mauza	Total amount of land (in acre)
Anowara	Barasat	Dudkumar	20

Total out of 181 land owners, 130 are male (71.82%) and 51 are female (28.18%) land owners. All those affected are titled land owners while there may have some sharecropper, lessee and agricultural laborer (non-titled) who will also be affected due to the Project intervention.

6.10 **Impact**

6.11 **Air Quality**

Air quality will be deteriorated slightly for transportation of construction materials to the Anwara substation site and civil works (land filling, foundation, RCC wok). Exhaust emission from the construction machineries and material carrying vehicles during construction activities will affect the ambient air quality.

Mitigation

- Water should be sprayed on road and material stockyards
- Temporary fencing at construction sites should be done
- Construction material should be covered with thick polythene while transporting

6.12 **Water Resources**

Construction wastes at substation site like sand, cement, stone, brick chips etc. would create obstacle to agricultural land, water bodies during construction period. The non-inert substances in construction waste those include bamboo, timber, vegetation, packaging waste and other wastes would create some potential impacts on the surrounding environment.

Mitigation

- The surrounding areas of the project should be kept clean.
- Signboards and public awareness are also required.

6.13 **Agricultural Resources**

The project initiation will convert the agricultural land into permanent structure. If this project is implemented the crop land will converted to permanent structure. Approximately 70 metric tons rice per year will be lost permanently.

Mitigation

- Fallow lands should be selected for the construction of towers and Substations.
- If avoiding is not possible, proper compensation should be introduced (for both standing crops and land).

6.14 **Ecological Resources**

Some part of the project location is a borrow-pit offers habitat to some tiny birds and invertebrates. Installation of substation will destroy their habitats. Therefore, they are required to be displaced from their micro habitat. It will receive little damage to its cropland vegetation during installation and installation of substation various ways like labor movement and construction vehicles movement, will also damage to wildlife habitat adjacent to project area. Occasionally, noise generated from construction machines or by labors would impacts negative to wildlife and their habitat. The overall impact on the ecological resources will be **moderately negative** in terms of wildlife habitat use.

Mitigations

- Avoid vegetation loss as much as possible during earthwork; and
- Keep vegetative area untouched during stockpiling of construction.

- Limit vegetation loss as much as possible;
- Avoid construction work during breeding season and destruction of nest and wildlife habitats;
- Use low sound emitting machineries during construction and avoid works in night.
- Use insulated cables to avoid death of flying mammals.

6.15 **Socio-Economic Resources:**

This project needs to acquire 20 acres of land. Due to land acquisition, arable land would be impacted in terms of construction of substation and stringing transmission line using those lands. According to the farmers, use of land for proposed substation and tower construction would affect land type of existing land that would have impact on the value of land in project.

Mitigation

- Fallow or barren Land needs to be identified for land acquisition.
- Proper compensation should be ensured before construction of substation for affected land owners.

It is to be noted that no environmental study is found for Anowara power plant.

7. Environmental and Social Baseline

7.1 Introduction

The environmental and social baseline condition for the ESIA study of "Proposed 400 kV double circuits TL from Anowara to New Mooring (Anandabazar) and 230 kV double circuit underground cable from Madunaghat to Khulshi and 230 kV LILO of Hathazari- Rampur in Chattogram division area project" has been prepared by collecting data from both secondary and primary sources. The secondary sources include Bangladesh Water Development Board (BWDB), National Water Resources Database (NWRD), Department of Public Health Engineering (DPHE), Bangladesh Meteorological Department (BMD) and Bangladesh Bureau of Statistics (BBS). Primary data has been collected during field visits in the study area.

7.2 Physical Environment

The physical environment is an important determinant of the environment. The term Physical environment means the material and tangible conditions in which we live. The baseline conditions of physical environment of the study area in terms of meteorology, seismicity, environmental quality, and natural disaster arepresented in the following sections.

7.3 Meteorology

The project comprises construction of substation and transmission lines. The places of construction will be close proximity to the sea as well as away from the sea. As such various meteorological data like rainfall, temperature, relative humidity, wind speed, evaporation and sunshine hours of Patenga BMD station near the sea and of Ambagan BMD station inside the Chattogram city have been collected. The data were analyzed and their status is discussed briefly in the following sections.

(a) Rainfall

Rainfall intensity is a crucial parameter for the study area. May to October are the wettest months having highest rainfall intensity while November to January are the driest part of the year with almost negligible rainfall. The record of last 30 years (1984-2013) of Ambagan station shows that the maximum of 846 mm rainfall occurred in June 1984. No or very little rainfall is recorded in the month of November to January. On the other hand, data of last 30 years (1984-2013) shows that the Patenga station experienced the maximum of 1457 mm rainfall in August 1984. No rainfall or very little rainfall is recorded in the month of December to February. The monthly maximum and average rainfall of Ambagan and Patenga stations are shown in **Figure7.1**.and **Figure 7.2** respectively.

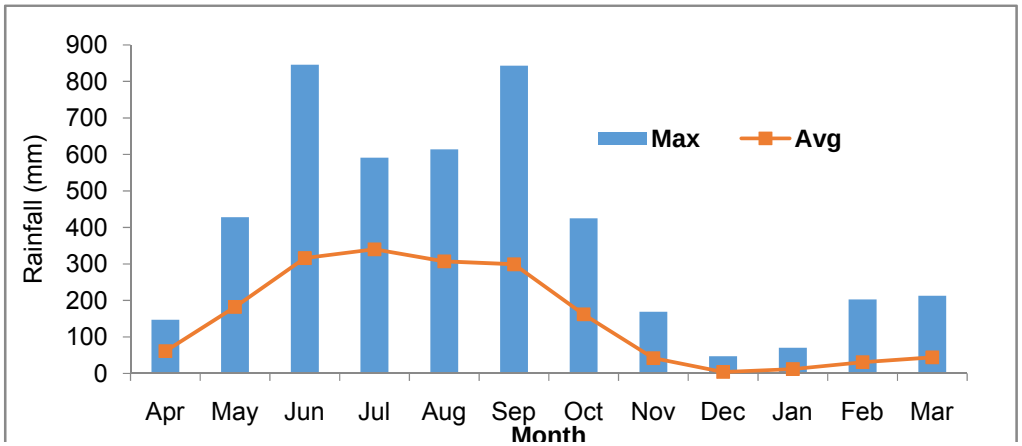


Figure7.1: Monthly variation of Rainfall at Ambagan BMD station (1984-2013)

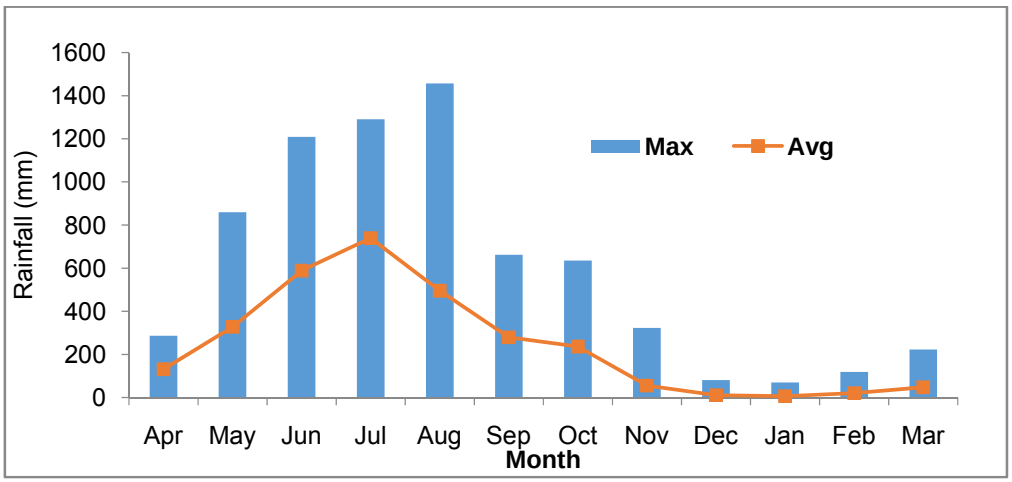


Figure7.2: Monthly variation of Rainfall at Patenga BMD station (1984-2013)

(b) Temperature

Temperature is recorded at both Ambagan and Patenga stations within the study area. The monthly average of last 30 years data (1984-2013) of Ambagan station shows that the maximum temperature varies from 28°C to 34°C and April is the warmest month while the minimum temperature varies from of 13°C to 25°C and January is the coldest month. While monthly average of last 30 years data (1984-2013) of Patenga shows that the maximum temperature varies from 28°C to 34°C and April is the warmest month while the minimum temperature varies from of 12°C to 25°C and January is the coldest month The monthly variations of average maximum and minimum temperature of Ambagan and Patenga stations are shown in **Figure 7.3** and **Figure 7.4** respectively..

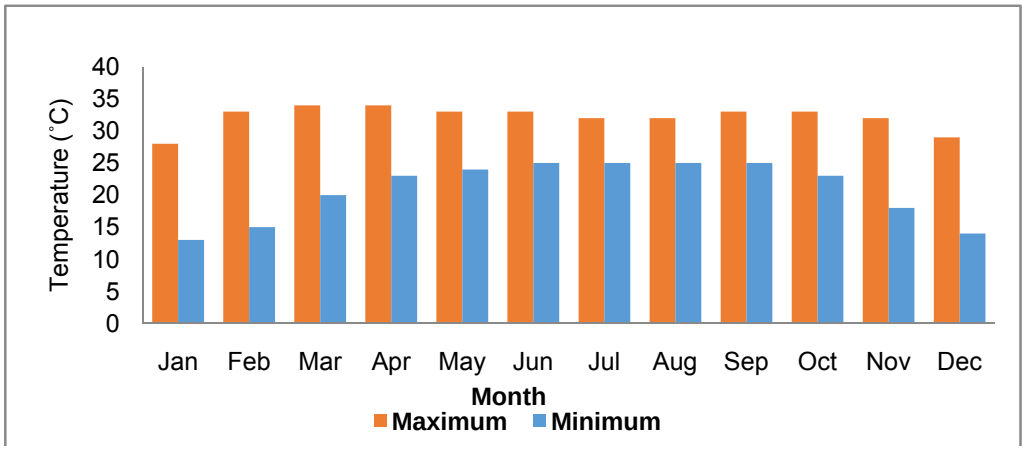


Figure7.3: Monthly variation of Temperature at Ambagan BMD station(1984-2013)

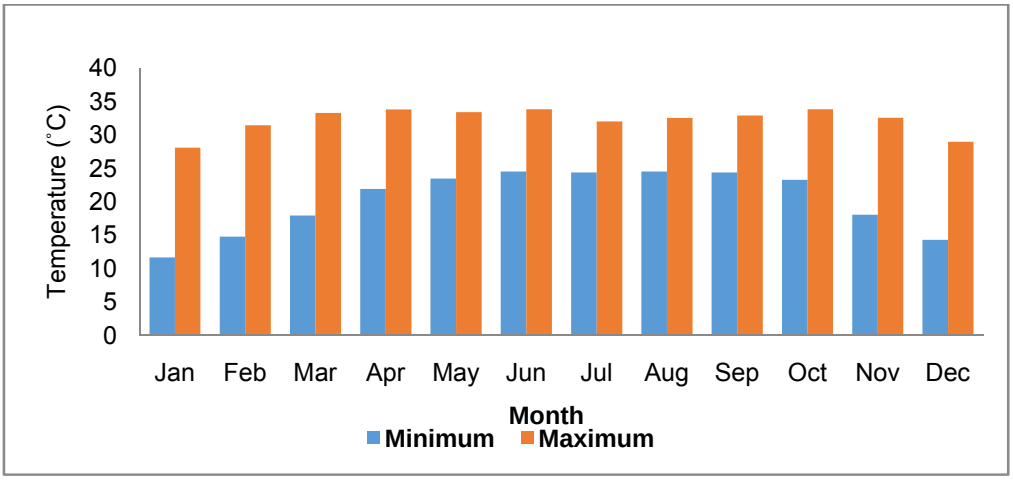


Figure7.4: Monthly variation of Temperature at Patenga BMD station(1984-2013)

(c) Relative Humidity (RH)

Relative humidity is a proportional measure of moisture in the atmosphere and expressed as percentages of the maximum amount the air could hold at the given temperature. There is only one station at Ambagan for recording RH data.

The average monthly relative humidity data collected from Ambagan BMD station for the last 30 years (1984-2013) is shown in Figure 5.5.It reveals that the RH vary seasonally from minimum of 67% in February to maximum of 87% in July.The most humid months are May to October when relative humidity remains greater than 80%.

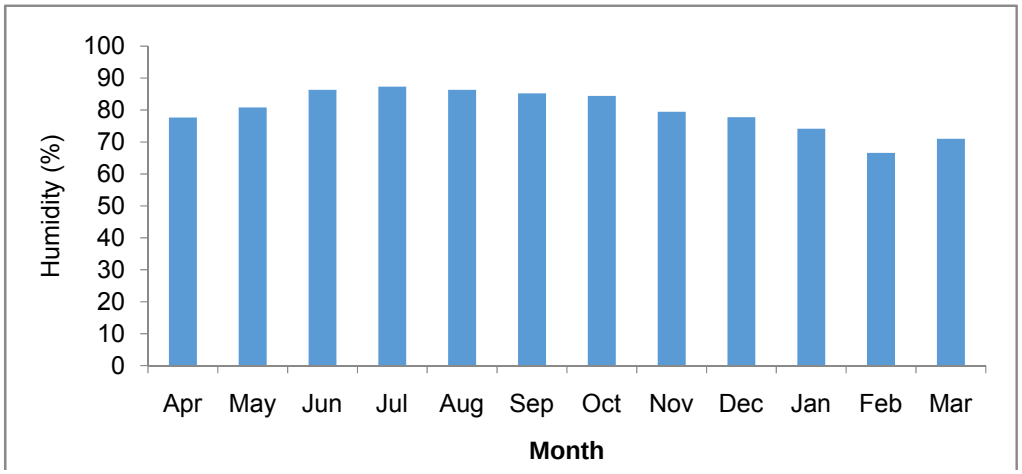


Figure 7.5: Monthly variation of relative Humidity at Ambagan BMD station(1984-2013)

(d) Wind Speed

Wind speed is measured at both Ambagan and Patenga stations. Winds in the area are mostly characterized by Southerly wind from the Bay of Bengal during monsoon. The average of last 30 years (1984 to 2013) data of Ambagan station shows that the monthly maximum wind speed varies from 30 to 130 km/day in a year and the maximum wind speed occurs in the month of April. On the other hand the average of last 30 years (1984 to 2013) data of Patenga station shows that the monthly maximum wind speed varies from 89 to 394 km/day in a year and the maximum wind speed occurs in the month of April. It may be noted that the maximum wind speed in Patenga station is much higher than that of Ambagan station due to its closeness to the sea The average monthly variation of wind speed at Ambagan and Patenga BMD stations are shown in **Figure7.6** and **Figure7.7** respectively..

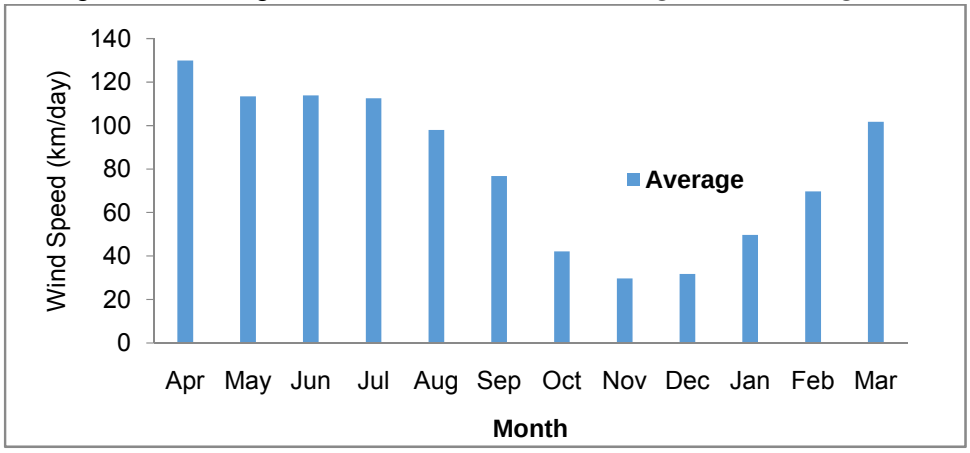


Figure7.6: Monthly variation of wind speed at Ambagan BMD station (1984-2013)

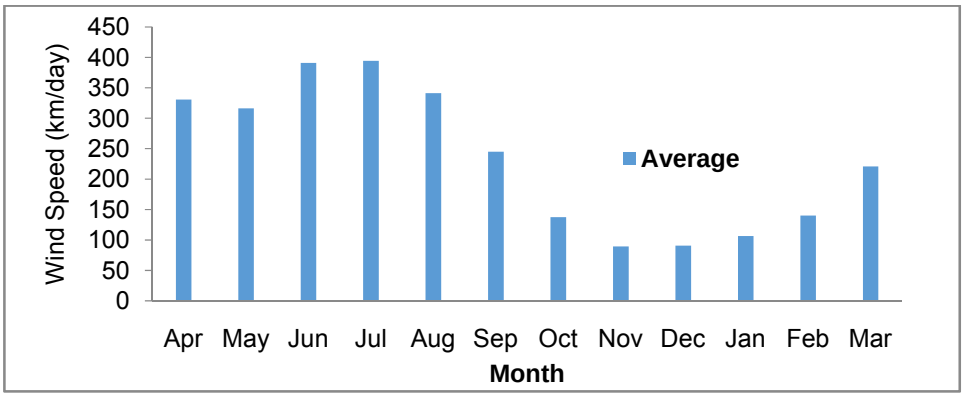


Figure 7.7: Monthly variation of wind speed at Patenga BMD station(1984-2013)

(e) Sunshine

The sun shine hours is measured at Ambagan station only within the study area. The data of sunshine hours for the last 30 years (1984-2013) has been collected from this BMD station and analyzed. It shows that the average monthly values of sunshine hours vary from 4 to 8 hour/day. The sun shine hours remain very high during November to April and very low during June to August. The average and maximum monthly sunshine hours are plotted in **Figure7.8**.

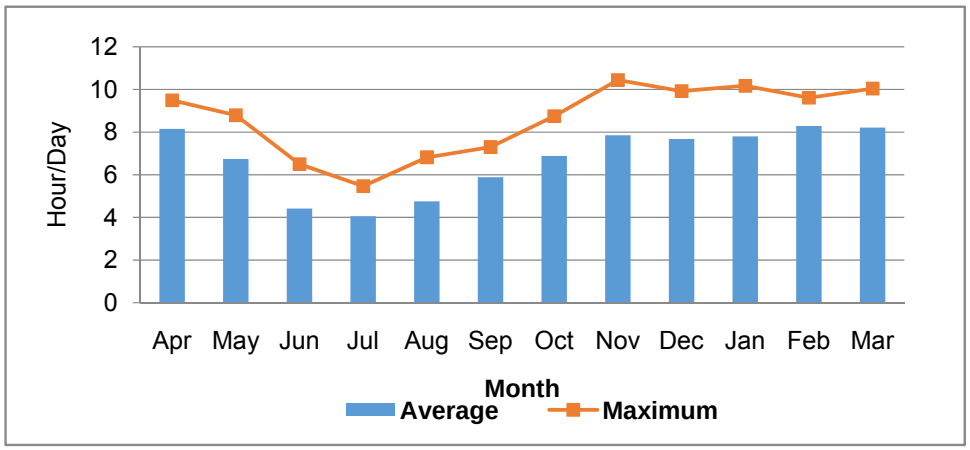


Figure7.8: Monthly variation of maximum and average sunshine hours at Patenga BMD Station (1984-2013)

7.4 Geology

Chattogram is the second largest metropolitan area largest port city of the country. More than four million people live in this city within 158 km^2 area experiencing a steady increase by 5%.

The Chattogram Hill Tracts originated as a result of the collision between India and Asian plate. Central Burma or Irrawaddy Basin represents the back-arc basin and Arakan-Yoma folded belt and its western extension up to Chattogram-Tripura hills, a part of which is the Chattogram Hill Tracts, represents the fore-arc basin. The thick sediments deposited in the Irrawaddy Basin during Miocene and Lower Pleistocene times are exposed in the Chattogram and Tripura hills. Hence, with the inception of convergence of the Indian Plate and the Tertiary sediments deposited in the fore-arc basin, the region was uplifted during

Miocene orogeny and followed by Pleistocene orogeny to form the present Arakan Yoma Mega-anticlinorium and its western extension covering Chattogram-Tripura mountain belt.Topography

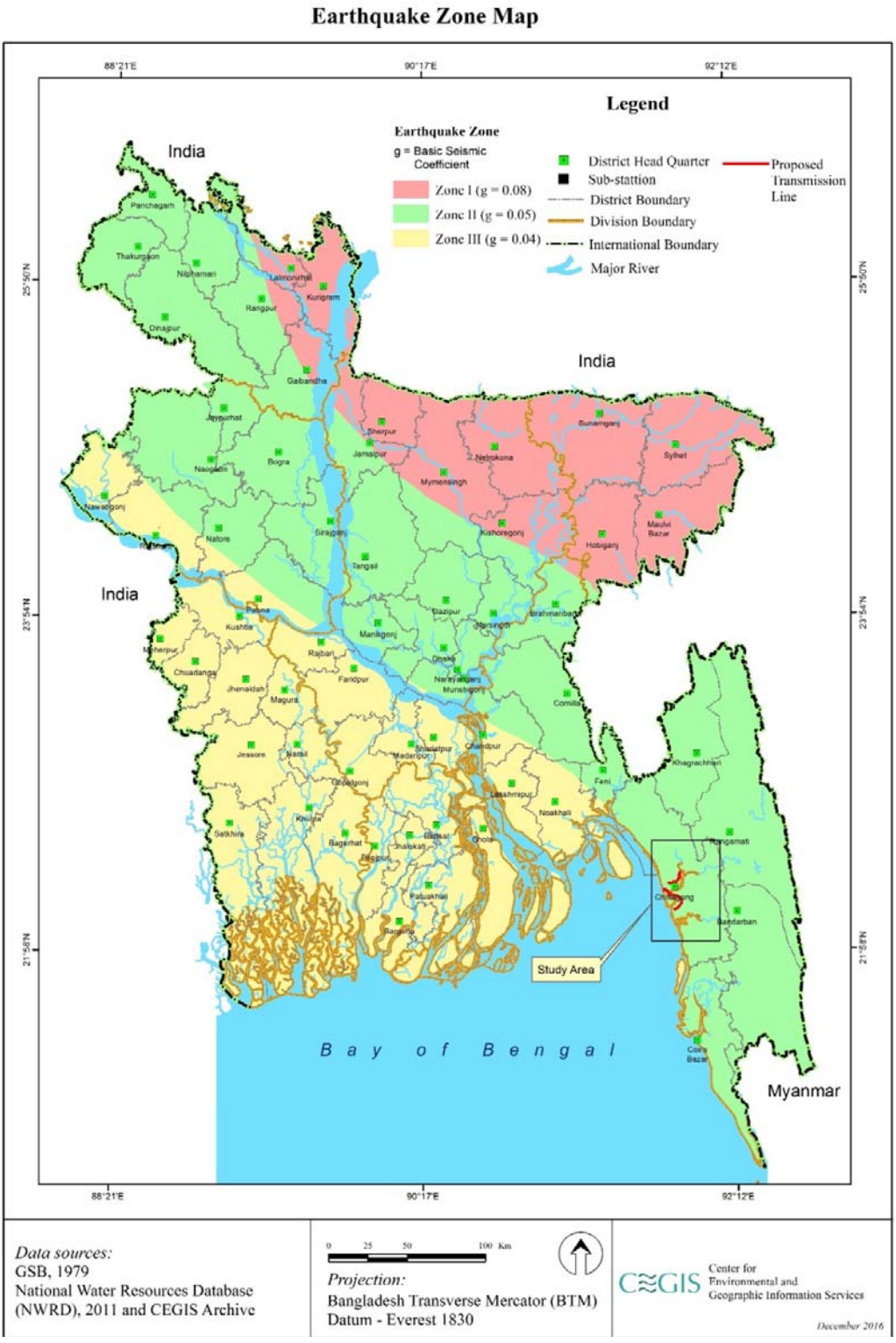
Chattogram straddles the coastal foothills of the Chattogram Hill Tracts in southeastern Bangladesh. The Karnafuli River runs along the southern banks of the city, including its central business district. The river enters the Bay of Bengal in an estuary located 12 kilometer (7.5 mi) west of downtown Chattogram. Mount Sitakunda is the highest peak in Chattogram District, with an elevation of 351 meter (1,152 ft). Within the city itself, the highest peak is Batali Hill at 85.3 meter (280 ft). Chattogram has many lakes that were created under Mughal rule. In 1924, an engineering team of the Assam Bengal Railway established the Foy's Lake. It is found that the maximum, minimum and average groundwater levels are approximately 87m, 13m and 54m respectively.

7.5 **Seismicity**

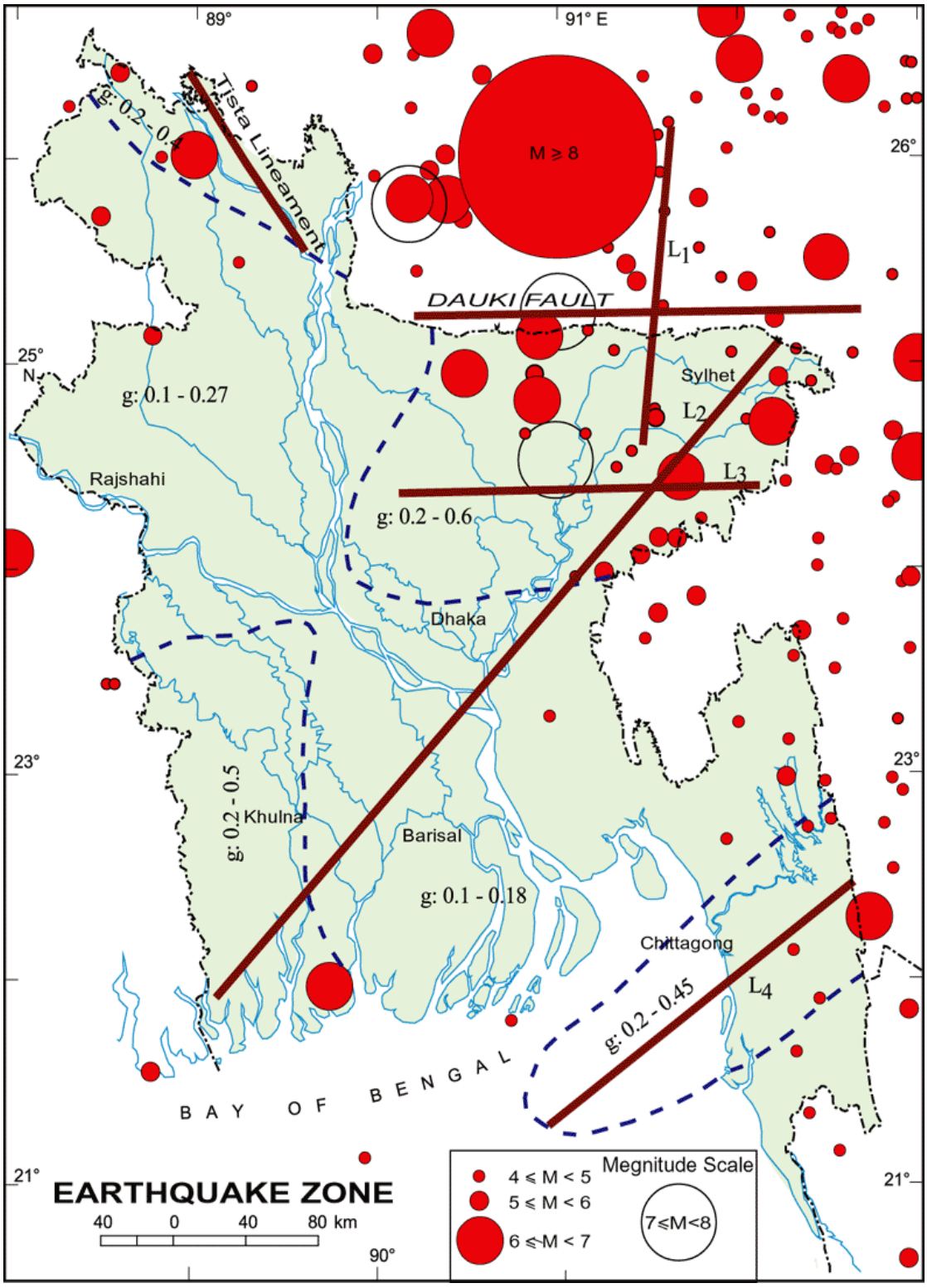
Bangladesh lies between 20°30’ and 26°40’ north latitude and 88°03’ and 92°40’ east longitude which is within an active seismic zone and the probability of earthquake is high. Tectonic framework of Bangladesh and adjoining areas indicate that Bangladesh is situated adjacent to the plate margins of India and Eurasia where devastating earthquakes have occurred in the past.

A seismic zoning map of Bangladesh was proposed in 1979 by Geological Survey of Bangladesh (GSB) dividing the country into three seismic zones: Zone-I, Zone-II, Zone-III.

The Chattogram District area falls under the Zone II shown in Map 5.1.The Zone-II comprising the central part of Bangladesh consists of the regions of recent uplifted Pleistocene blocks of the Barind and Madhupur and the western extension of the folded belt with the Bask seismic co-efficient of 0.05g. The first recorded earthquake in 1548 was a terrible one as Chattogramwas violently shaken. The earth opened in many places and threw up water and mud of a sulphurous smell. Besides, there are also different geological faults in and around the country, as shown in **Map 7.2**. Accordingly, the maximum magnitude of earthquake is in the range of 4≤M<5 on the Richter’s scale in and around of Narsingdi District.



Map7.1: Earthquake zoning map with seismic coefficients of the study area



Map7.2: Different geological faults of Bangladesh and the study area

7.6 Water Resource System

River System

The study area consists of substations (SS) and transmission lines (TL) in different locations in South-east coast under Chattogram District. The substation sites located adjacent to the Bay of Bengal and the transmission lines will cross over numbers of khals and river in the study area. The the overhead portion of the Anowara to New Mooring (Anandabazar) transmission line will cross over a number of major and branch khals as well as a river (Karnafuli river).The khals are Char Lakkhakhal, Shikalbaha/Murarikhal, Karnafuli canal and Mahesh khal. The line will also cross over the Karnafuli river near the Chattogram Port where the river width is about 700 m and some portion of the line will be cross underground beneath the Mahesh khal near the Port area. The river and khals having tidal influences. Another transmission line from Khulshi to Madhunaghat substation will be underground along with the Dhaka-Chattogram Highway, CDA Avenue, Chattogram-Cox's Bazar Highway and Chattogram-Rangunia-Kaptai Road and cross beneath the Chandgaon khal and Burirchar khal. The Madhunaghat substation is located besides the Halda river.

Water Availability: Surface Water

Chattogram is both a hilly and a coastal district. Surface water is available from spring, river lakes, ponds and especially from sea. Major surface water bodies are the Bay of Bengal, Sangu, Karnafuli, Bakkhali, Koholia, and Meghna. The proposed New Mooring (Anandabazar) substation is located adjacent to the sea near Patenga beach

Water Availability: Ground Water

The groundwater data of BWDB observation well around the study area (station CHI008), was collected from NWRD-CEGIS database archives for the period from 1984 to 2013. The stationCHI008 is located in Patenga Upazila of Chattogram District. It is observed that the depth of groundwater from the ground surface in dry season goes downward and depth is highest in April at CHI008 station. On the other hand, water Table rises in monsoon and the lowest depth is observed in August due to recharge by rain water. **Figure 6.9** shows the monthly variations of ground water depth.

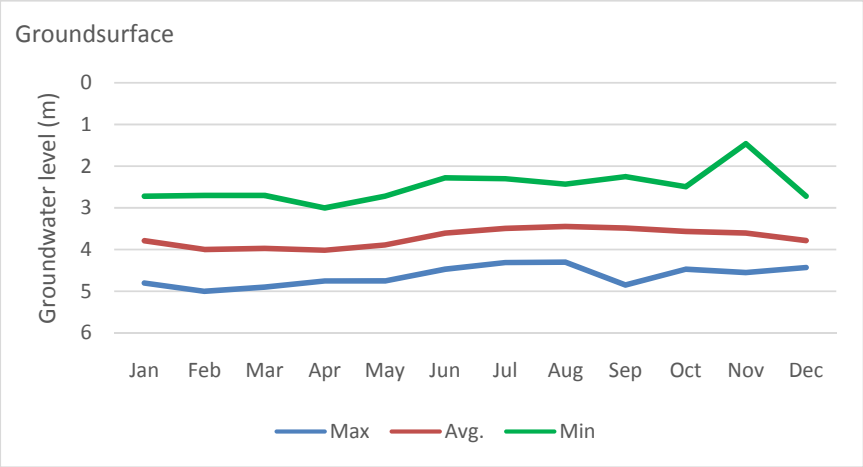


Figure 7.9: Depth of ground water at CHI008 around the study area

Drainage Congestion

Drainage congestion or drainage problems was found in proposed substation site of New Mooring (Anandabazar) and Khulshi and Madunaghat Sub-station area during the field visit.

Natural Hazards

Storm

There are some evidences of local seasonal storms, popularly known as nor'westers *(Kalbaishakhi).* Severenor'westers is generally associated with tornadoes. The frequency of nor'westers usually reaches maximum in April, whereas it is low in May and minimum in March. Nor'westers and tornadoes are more frequent in the afternoon. Nor'westers may occur in late February due to early withdrawal of winter from the Shillong Plateau of India.

Cyclone

The coastal regions of Bangladesh are subject to damaging cyclones almost every year. They generally occur in early summer (April-May) or late rainy season (October-November). Cyclones originate from low atmospheric pressures over the Bay of Bengal.

A tropical cyclone forming in the Bay of Bengal has a lifetime of one week or longer. The height of the surges is limited to a maximum of 10 meters in the bay. When propagating into the shallower inland coastal areas, the heights of these waves are further reduced. The frequency of a wave (surge plus tide) with a height of about 10 m is approximately once per 20 years. A storm surge of approximately once in 5 years has a height of about 7 m (surge plus tide).

The study area faced devastating natural disasters in April, 1991 and May, 1997 where many people were victims of the cyclones. Besides, these natural disasters also caused heavy damages to settlements, livestock and other properties of the area. In 1991, the tropical cyclone reached on the land on 29 April with wind speed of around 240 km/h and the storm formed a 6 m high surge that inundated the entire area. In 1997, another strong tropical cyclone arrived on land on 17 May with winds of 215 km/h and occurred huge damage in the area.

The New mooring sub-station site situated beside the sea. It is to be mention here that the sub-station will not be hampered during cyclone or tidal flooding as there is elevated and wide road namely Chittagong Coastal road will act as embankment and having bank protective work along with the road that will protect the area from any natural disaster.

Landslide

Landslide has become a major disaster in the hilly regions of Bangladesh, occurring almost every year. From physical survey, it is observed that soil characteristic of Chattogram Hill Tracts (CHT) is alluvial, silty clay which is vulnerable to landslides. Human activities such as deforestation, jhoom cultivation and hill cutting have made the slopes unsTable. In addition, excessive rainfall during monsoon cause rain cut erosion which results to landslides. During the last five decades, CHT suffered about 12 major landslides. Most devastating landslides occurred in 2007 and 2017. The landslide on 11th June, 2007 which occurred in several areas near Chattogram city was one of the severest of such occurrences in the country's history causing death of 127 people. Very recently, on 13th June, 2017 CHT experienced massive landslides. A large number of foothill settlements and slums were demolished; more than 152 people died and huge resource destruction took place.

It is to be mention that the project site Khulshi Sub-station, Madunaghat Sub-station and proposed New Mooring Sub-station and the Transmission tower are not situated in or beside any Hilly area, as such the project are will never be affected by the landslide effect.

7.4 Environmental Quality

Data on air quality, water quality and noise level was collected to assess the environmental quality at baseline condition which is discussed in the following sections.

Noise Quality

The standard values for noise as per Environmental Conservation Rules of Bangladesh are shown in **Table 6.2.**

Table 7.1: Standard Value (dBA)

Category	Categories	Standard value (dBA)	
		Day	Night
A	Silent zone	45	35
B	Residential area	50	40
C	Mixed area (mainly residential area, and also simultaneously used for commercial and industrial purposes)	60	50
D	Commercial zone	70	60
E	Industrial zone	75	70

Source: Environmental Conservation Rules, 1997, DoE

As the transmission lines will cross mainly agricultural lands (open spaces) and Main town road, the standard value for ambient noise should be below 60 dBA. **Table 6.3** shows the noise levels of some locations in the study area and found within the standard. However, details of noise quality would be carried out in the major field investigation to be conducted during ESIA.

Table 7.2: Noise Level of Several Locations

Sl. No.	Date and Time	Location	GPS Coordinate	Day-time Noise Level (dBA)	Night-time Noise Level (dBA)	Area Category by DoE
01	17.04.17 02:54pm and 9:45pm	New Mooring (Anandabazar) Proposed substation	N 22° 19' 29" E 91° 46' 1.5"	53	41	Mixed area
03	19.04.17 10:12 am and	Khulshi substation	N 22° 21' 42" E 91° 47' 46"	56	43	Mixed area

Sl. No.	Date and Time	Location	GPS Coordinate	Day-time Noise Level (dBA)	Night-time Noise Level (dBA)	Area Category by DoE
	10:15pm					
04	27.11.2018 11:00am and 9:30pm	Madunaghat Sub-station	N 22°25'55.77" E 91°52'15.05"	57	47	Commercial area

Source: CEGIS Study'2017

Notes:

1. The time from 6 a.m. to 9 p.m. is counted as daytime.

2. The time from 9 p.m. to 6 a.m. is counted as night time.

3. Area up to a radius of 100 meters around hospitals or educational institutions or special institutions/ establishments identified/to be identified by the Government is designated as Silent Zones where use of horns of vehicles or other audio signals, and loudspeakers are prohibited.

Air Quality

The ambient status of air quality parameters viz. Particulate Matters(PM), Ozone (O3), Oxides of Nitrogen (NOx), Carbon Monoxide and Ozone representing the quality of pollution level have been collected from DoE. The CAMS station was at Agrabad in Chattogram. It is observed that the values of parameters in almost all of the points are within the allowable limit as compared to GOB as well as WB standards. The measurement results are presented in Table 6.4.

Table 7.3: Value of Air Quality Parameters in Chattogram

Date of Measurement	Location	Concentration present of different parameters in ambient air				
		($\mu g/m^3$)				(mg/m^3)
		$PM_{2.5}$	PM_{10}	NO_x	O_3	CO
April 2015	Agrabad, Chattogram (22.32N, 91.81E)	58.48	92.82	DNA	10.81	1.83
	Bangladesh standard	**65**	**150**	**100**	**235**	**40**
	IFC/WB Standard	**75**	**150**	**200**	**160**	**100**

Source: Monthly Air Quality Monitoring Report, April 2015, DoE

Note: $PM_{2.5}$=Fine Particulate Matter, PM_{10}= Respirable Dust Content, NO_X = Oxides of Nitrogen, CO = Carbone Mono-Oxide, O3= Ozone; DNA=Data Not Available.

7.7 Land Resources

The proposed project interventions under this study are establishment of underground and overhead power transmission line and construction of two (2) substations. The proposed

transmission line will pass through the Chattogram Coastal Plain (AEZ: 23) in Hathazari, Chandgaon, Panchlaish, Khulshi and Chattogram sadar Upazilas and pass over the same AEZ in Patiya and Anowara Upazilas; and also will pass over the Northern and Eastern Hills (AEZ: 29) in Anowara Upazila.The proposed two substations will be constructed in the Chattogram Coastal Plain (AEZ: 23).

The Right-of-Way (RoW) of proposed overhead transmission line from Anowara to Patiya Upazila will pass over the agriculture land and most of the tower will be constructed on agriculture land. Then the line will passes over the Karnafuly River. After that the overhead line will go underground upto New Mooring.An underground power transmission line will be erected from Khulshi to Hathazari along the roadside. The RoW of proposed underground transmission line is mainly non agriculture land. It is to be noted that, agricultural land mentioned in land use Table for underground transmission line is mainly fallow/barrel land of urban and semi urban area. These lands showed as agricultural land in satellite image. But from the field visit, the ESIA team verified these land as fallow /barrel land. Besides this, local roads and levees between agricultural lands will be used as temporary road for transporting construction material. So that new road construction for this project will not be needed.

The Proposed New Mooring substation will be constructed on agricultural land. But, theKhulshi substation will be constructed on non-agricultural fallow land (within the substation area).

In case of ESIA, 100 m area is considered as impacted zone of right of the way (ROW) where, central 20 m area in ROW is considered as direct impact area (DIA) and another 80 m (40 m in both side of DIA) is considered as indirect impact area (IIA). Detailed land use of RoW of transmission line and substation are presented in Table 7.5 to Table 7.6.

Table 7.4: Land Use of Direct Impacted Area (DIA) Considering 20m RoW

Land Use	Anowara to New Mooring Overhead Transmission line	Anowara to New Mooring Underground Transmission line	Khulshi to Madhuna ghat Underground Transmission line	LILO New Mooring Underground	Total Area (ha)	% of total area
Built-Up Non-Linear	0.81	7.65	22.85	0.00	31.31	36.66
Fresh Water Aquaculture	0.03	0.00	0.00	0.00	0.03	0.03
Agricultural land (NCA)	28.46	1.17	0.33	0.56	30.52	35.72
Orchards and Other Plantations (Trees)	0.62	0.91	0.88	3.21	5.62	6.58
Rivers and Khals	2.02	0.04	0.07	0.00	2.13	2.50
Rural Settlement	7.94	1.17	4.97	1.21	15.29	17.90
Forest Plantation	0.00	0.00	0.01	0.00	0.01	0.01
Shrub Dominated Area	0.00	0.00	0.00	0.00	0.00	0.00
Mud Flats or intertidal zone	0.00	0.17	0.00	0.34	0.51	0.60

Grand Total	39.88	11.11	29.12	5.32	85.42	100.0

Source: ESIA study and NWRD-2012.

Table 7.5: Land Use of Indirect Impacted Area (IIA) Considering 80m RoW (40m in Both Side of DIA)

Land Use	Anowara to New Mooring Overhead Transmission line	Anowara to New Mooring Underground Transmission line	Khulshi to Madhunaghat Underground Transmission line	LILO New Mooring Underground	Total Area (ha)	% of total area
Built-Up Non-Linear	4.74	38.07	112.25	0.00	155.06	36.39
Fresh Water Aquaculture	0.81	0.47	0.00	2.37	3.65	0.86
Agricultural land (NCA)	137.03	7.20	5.86	8.02	158.10	37.10
Orchards and Other Plantations (Trees)	0.19	2.82	1.48	8.64	13.13	3.08
Rivers and Khals	9.95	0.58	0.51	0.28	11.32	2.66
Rural Settlement	44.05	4.11	25.12	4.24	77.52	18.19
Forest Plantation	0.00	0.00	0.78	0.00	0.78	0.18
Shrub Dominated Area	0.00	0.00	0.17	0.00	0.17	0.04
Mud Flats or intertidal zone	0.00	2.76	0.00	3.66	6.42	1.51
Grand Total	196.75	56.02	146.17	27.22	426.16	100.00

Source: ESIA study and NWRD-2012.

Table 7.6: Land Use of Substation Area

Substation Name	Landuse	Area (hectare)
New Mooring	Agriculture	7.29
Khulshi	Settlement (inside existing substation)	0.12

*Source: ESIA study and NWRD-2012. *it is to be noted that, new mooring substation will be constructed under different project and will be upgraded to 230/132 kV under this project.*

7.8 Agriculture Resources

7.9 Cropping Pattern and Intensity

The agricultural lands fall in both underground and overhead transmission line area. The 20 meter RoW of underground lines pass through the urban areas of Chattogram City Corporation. But in case of 100 meter RoW, both agricultural and non-agricultural lands fall. However, most of the agricultural lands of urban area remain fallow throughout the years. The 20 and 100 meter RoW of overhead transmission lines is mainly agriculture land. Most of the areas are double cropped followed by some triple cropped and single cropped areas.Hybrid Aus and summer vegetables are grown in Kharif-I and HYV in Kharif-II, while HYV Boro and winter vegetables are grown in Robi season. The cropping intensity of overallstudy area (both IIA and DIA) is about 159%, while the cropping intensity of DIA is about 162%.

One new substation (New Mooring) will be constructed in agricultural land, while one substation will be constructed in non-agricultural land (Khulshi). The substation site of new mooring is double cropped and the cropping intensity of this area is about 200%.

7.10 **Crop Area and Production**

Total cropped area is 46 ha in direct impacted area (20m RoW) of which rice is 37.7ha and vegetables is 8.3 ha. Total production of the area is about 239tons, where rice production is 119ton and vegetables production is 120 ton. Detailed cropped area and production of the RoW is presented in**Table 7.7.**

Table 7.7: Cropped Area and Production in Proposed RoW

Crop Name	Crop Area (ha)			Crop Production (tons)	
	20 m RoW	100 m RoW	Crop Yield (ton/ha)	20 m RoW	100 m RoW
Aus	3.6	16.5	3.8	14	63
Aman	28.5	136.0	2.9	83	394
Boro	5.7	25.5	3.9	22	99
Total Rice	37.7	178.1		119	557
Summer Vegetables	2.1	9.0	13.0	28	117
Winter Vegetables	6.2	29.0	15.0	92	435
Total Non Rice	8.3	38.0		120	552
Grand total	46.0	216.1		239	1109

Source: ESIA Study, 2017.

In substation area total cropped area is 14.58 hectare and production is 65.89ton. Detailed cropped area and production by substations is presented in**Table 7.9.**

Table 7.8: Cropped Area and Production in Proposed Substation

Crop Name	Crop Yield (ton/ha)	New Mooring Substation	
		Crop Area (ha)	**Crop Production (Ton)**
Aman	2.9	7.29	21.14
Boro	3.9	5.82	22.7
Vegetables	15.0	1.47	22.05
Grand total		14.58	65.89

Source: ESIA Study, 2017.

Approximately 59 overhead towers will be constructed to connect different substation under this project. These towers will require 2.33 ha land where 1.84 ha is fallen in agricultural land. Around 27 tons crop is produced in tower footing of which 12 ton is rice and 15 ton is non rice crop.

Irrigation coverage of the study area is 100% of NCA during the rabi/dry season. Irrigation is provided by using shallow tube wells (STW) and Deep Tube wells (DTWs) in HYV Boro, potato, vegetables and wheat. Intercultural operations (weeding, thinning etc.) are mainly done by traditional ways.

7.11 **Ecological Resources**

The substations (SSs) and transmission lines (TLs) proposed under this project covers different ecosystems in Chittagong Town and Anowara Upazila of Chittagong district. The study was designed to conduct total 100 meter of study area which include 20 meter direct impact area (DIA). Of the project, a major portion of the transmission lines has been proposed to be underground. The study was conducted through a line transect walk to document the base situation and impact of the proposed interventions on ecological resources of the designated area during i.e. pre-construction, construction and operation phases. Brief description ofecological resource is presented inthe section**7.6.4**.

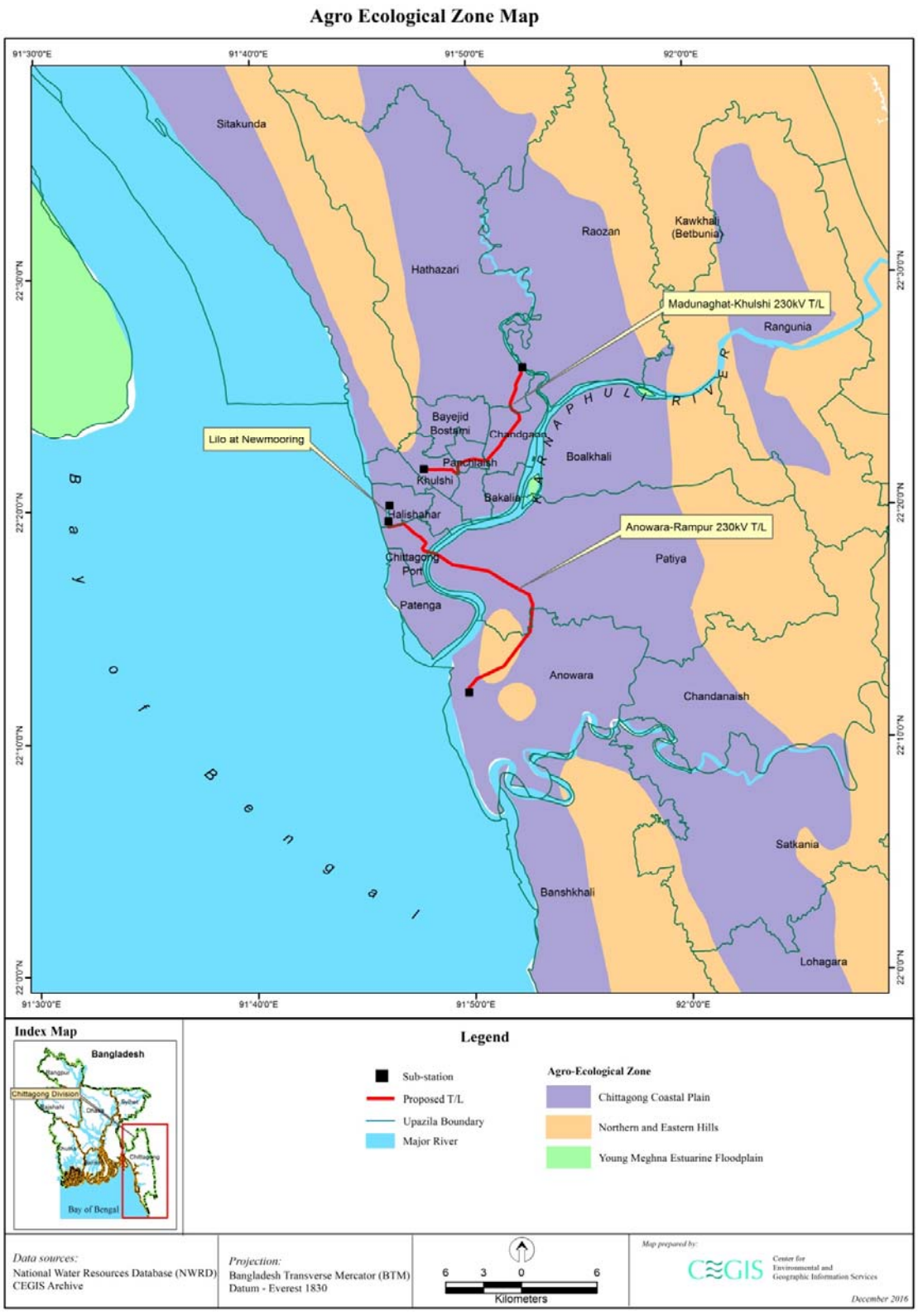
7.12 **Bio-ecological Zone**

The International Union for Conservation of Nature (IUCN), Bangladesh has divided the whole country into 25 Bio-ecological Zones in the context of biological diversity (Nishat *et al.* 2002). The study area (GIA) include project area (496 ha)covers i) Chittagong Hills and the CHTs, and ii) Coastal Plains. The project site, the direct impact area possesses mostly terrestrial ecosystem. Information regarding the Power Grid Company's transmission lines and substations is given briefly in table 5.9.

Table 5.9: Bio-ecological Zones of the study area

Zone	Transmission Lines	Substations	Area (ha)
i) Chittagong Hills and the CHTs ii) Coastal Plains	i) Anowara-NewMooring400kV doublecircuitLine:27km ii) LILO of Hathazari-Rampur 230kV double circuit underground cable at New Mooring: 3 km iii) Madunaghat-Khulshi230kV doublecircuitunderground Cable:16km	i) 230/132 kV GIS at New Mooring ii) 230/132/33 kV at Khulshi	496

To show bio-ecological zones of the study area, a map is given in theMap7.3.



Map 7.3: Bio-Ecological Zone of the study area

7.13 **Substation wise ecological information**

Two substations have been proposed to install as follows. A brief description on ecological resources is presented under biological description.

Sl. No.	Name of the Sub-station	Biological description	Picture
1	230/132 kV GIS at New Mooring, Chittagong	The proposed land is purely an agricultural land for cultivation of vegetables and other crop varieties. The periphery of this land is covered by bushy herbs and shrubs. Of the fauna, Black Drongo, Asian Pied Starling, and Red-vented Bulbul were noticed during the major field investigation.	

Sl. No.	Name of the Sub-station	Biological description	Picture
2	230/132/33 kV at Khulshi, Chittagong	The proposed site is a garden of PGCB within its (substation) boundary. Type of planted species in this area is largely ornamental for beautification purposes only. But the periphery of the garden is adorned with fruiting trees like mango, jackfruit, etc.	

7.14 Transmission line wise ecological information

The proposed transmission line from Khulshi to Madunaghat (16 km) underground cable will cross over the existing road. Similarly, New Mooring to Anowara underground transmission lines (TL) will crossover a busy area of Chittagong Port. The Karnafuli River system and remaining area at Anowara have been proposed to have overhead transmission lines. It will cross over agricultural lands which are mainly occupied with different crops.

7.15 **Ecosystem**

The ecosystem of the current study area belongs to mainly two ecosystems: terrestrial and aquatic ecosystems. Brief descriptions of these ecosystems are given below.

Terrestrial Ecosystems

The terrestrial ecosystem is classified into two major groups' namely terrestrial flora and terrestrial fauna.

Terrestrial Flora

According to the field investigation, the terrestrial flora of the study area has been divided into three subcategories based on landscape and vegetation patterns: i) Homestead/settlement vegetation, ii) Crop-field vegetation, and iii) Roadside vegetation. A description of the above mentioned subcategories is presented below:

i) Homestead/settlement vegetation is the type of vegetation those occurs within the home territory. Most of the study area, approximately 95% is in the urban except for Anowara. The project and study sites at Anowara are purely rural with different fruiting trees. Neither study area nor project area cover significant homestead areas. Homestead vegetation found in this area is low in terms of abundance and diversity. Dominant species of this area recorded were Banana (*Kola*), Indian Shirish (*Gagan Shirish*), Drumstick (*Sajna)*, Betel-nut (*Supari*), Albizia (*Koroi*), *Eucalyptus,* and Acacia (*Akashmoni*).

ii) Crop-field vegetation is the vegetation of croplands and peripheries except for crop varieties. The transmission line (TL) especially at Anowara area has been proposed over agricultural land is covered with different crops including vegetables and grass species. Dominant species of the cropland especially weeds were Kaisa and Bermuda grass (*DurbaGhash*). Although the crop-field vegetation shows less diversity but it provides feeding habitats to tiny wildlife.

iii) Roadside vegetation occupies road slopes of any given area. The existing roads both in the Chittagong Town as well as Anowara have been covered by few dominant species of plants. During primary field investigation the dominant species were noted as Pink Morning Glory (*Dhol Kolmi*), Indian Rosewood (*Sisu*), Indian Coral Tree (*Mandar*), Hill Glory bower (*Bhat*), and *Shialmutra*. Typical views of these subcategories have been presented in the Picture 5.3

Homestead vegetation, Khulshi

Homestead vegetation, Anowara

Roadside vegetation, Anowara

Crop-field vegetation, New Mooring

Figure 7.10: Terrestrial vegetation of the study area

Terrestrial Fauna

The study area belongs to mainly urban ecosystem, which has been highly disturbed by human activities. Therefore, diversity of wildlife species in this study area is very low. A brief account of terrestrial fauna is provided below in accordance with their hierarchy:

Amphibians are not truly terrestrial in account of their life cycle. They possess a diversified life cycle from larva to adult stages. Common Toad (*Kuno Beng*), Ornate Microhylid Frog (*China Beng*),Ballon Frog (*Potka Beng*),andIndian Cricket Frog (*Jhi-Jhi Beng*) were noted dominant species throughout the study area. Most of the amphibians inhabit to the edges of ponds,paddy-fields, ground holes, grasslands, bushes and tree holes. According to IUCN-Bangladesh (2015a), the Microhylid Frog has been categorized as Least Concern (LC) species to the country.

Reptile known as diversified group in comparision with the amphibians. They are found abundant especially in a rural area like Anowara but occasional in the urban ecosystem. The Common Garden Lizard (*Girigiti*), Northern House Gecko (*Tiktiki*), Bengal Lizard (*Gui Shap*), Common Kukri Snake (*Boloy Uday Kal*),BengalMonitor (*Gui Shap*),and Banded Krait (*Shankhini Shap*) were found dominant during the study. According to locals, Monocled (*Gokhra Shap*) and Binocled Cobras (*Khoi Gokhra*) said to be found in this rural area. Of them, Bengal Monitor (NT[11]), Monocled Cobra (NT) and Binocled Cobra (NT) have been categorized as near threatened species to the country by IUCN-Bangladesh (2015a).

Avifaunais usually roaming in the homesteads and roadsides of the study area. Birds observed frequently in this area and they were Black Drongo (*Fingey*), Red-vented Bulbul (*Bangla Bulbuli*), Common Myna (*Bhat Shalik*), Asian Pied Starling (*PakhraShalik*), Oriental Magpie Robin (*Doel*), Brahminy Kite (*Shankho Cheel*), Spotted Dove (*Tila Ghughu*), Coppersmith Barbet (*BosontoBauri*), Baya Weaver (*Babui*), Blue-eared Kingfisher (*Neelkan Machhranga*) and Common Tailorbird (*Suta Tuntuni*).No threatened species were observed within the project (DIA) as well as the study areas (GIA).

[11] NT- Near Threatened, LC- Least concern, VU-Vulnerable

The *IBA (Important Bird Area)* is situated at Patenga Sea Beach (22°14'N 91°48'E) area far from project area (4.54 km from Anowara, and 7.48 km from New Mooring) (MoEF, 2001). There area no ECAs in the project as well as study area.

No *Birdflyway*[12] has been identified across the proposed transmission lines as well as substations area.

Mammals are very magnificent species, especially larger individuals. But large and medium-sized mammals have disappeared from this study area due to habitat conversion into human settlement. The mammals found in the study area include: Common House Rat (*Ghor Indur*), Jungle Cat (*Bonbiral*), Common Mongoose (*Boro Beji*), Indian Flying Fox (*Kolabadur*), Irrawaddy Squirrel (*Kathbirali*), and Indian Pipistrelle (*KhudeyChamchika*). Of them Common Mongoose (LC), Irrawaddy Squirrel (LC), and Jungle Cat (NT) have been included in the IUCN-Bangladesh Redlist (IUCN-Bangladesh, 2015b[13]).

Aquatic Ecosystem

The entire study area belongs to a few aquatic ecosystems including major river system Karnafuli. In accordance with the duration of inundation, the existing ecosystem has been divided into two categories namely seasonal and perennial wetlands.

The seasonal wetlandinundates for 4 to 5 months, especially during the monsoon. Canals and ditches have been considered under this category on the basis of duration of inundation.

The perennial wetland inundates throughout the year. The Karnafuli River system is only the aquatic ecosystem bears such characteristics of holding water all the year-round. Typical views of the wetlands are given in the **Picture 5.4**.

Seasonal wetland, Anowara

Perennial wetland, Karnafuli River

Figure 7.11: Aquatic ecosystem of the study area

Major components of these wetlands can be classified into major two groups: aquatic flora and aquatic fauna. A brief discussion on these is given below:

12 Information provided after consulation with Enam Ul Haque, a renowned bird expert in Bangladesh, and founder presidendent Bangladesh Bird Club

[13]Here: LC= Least Concern; VU=Vulnerable; NT=Near Threatened

Aquatic Flora

The dominant aquatic flora both in the seasonal and perennial wetlandsobserved in the study area were Chinese Spinach (*Kolmi*), Water Hyacinth (*Kochuripana*)andCommon Duckweed (*Khudipana*).

Aquatic Fauna

Fauna of this ecosystem is not dominant in terms of diversity and population size, but they viable both in the urban and rural areas. Available species recorded during the field investigation were Skipper Frog (*Kotkoti Beng*), Indian Bullfrog (*Sona Beng*), Pond Heron (*Kani Bok*),Little Cormorant (*Pankouri*), River Lapwing (*Nadi Titi*), Common Snipe (*Pati Chega*) and Little Egret (*Chhoto Bok*). Only aquatic mammal the Ganges River Dolphin (*Susuk*) is also notedas available in the perennial wetland, the Karnafuly River

7.16 **Fisheries Resources**

Fisheries resources of the study area have been delineated considering the components of the proposed Project, which are dealt in Project Description in Chapter 4. The components are: (i) construction of new substation; and (ii) transmission line (overhead and underground).

The land type of the new substation sites are medium highland. According to local people, the areas are not inundated during wet season. For this reason, the proposed sites have no fisheries concern.

The ancillaries of the transmission line are towers and anchors. From the Project description, it is observed that the transmission line will cross over the Karnafuli River using existing towers, substations will be built on medium highlands and underground transmission line will pass through city using existing road. Considering above mentioned factors, it can be concluded that there is very limited fisheries issue in the Right of Way (RoW) of the transmission line. There is one fish pond comprising of 7 decimal area will partially fall under the RoW. Aquaculture practice of the pond is done mostly extensive method. The estimated total fish production of the pond is around 0.06 metric ton of fish annually.

8. Stakeholder Consultation

8.1 Introduction

Consultation with the affected stakeholders made a significant understanding about the stakeholder's concerns and suggestions for the implementation of proposed project. It helps to set a positive tone for conversations with the affected people regarding the potential impacts and proposed mitigation measures. The involved stakeholders would be informed getting the project information, and it can provide suggestions to make change in the project plans and designs.

For the proposed Strengthening of Power System Network project in Chattogram, several consultations regarding the aspect of construction, project benefits and impacts shared with the affected people applying different consultation tools (i.e. PCM, KII, and GD).

In the consultation process, the stakeholders got involved with the study consultants to understand the project interventions considering the local needs and aspirations. The proposed interventions, findings of the Environmental and social study, and the EMP were shared with the project stakeholders for obtaining their perceptions, views and feedbacks on the probable changes that will be happened within the project area.

8.2 Objectives

The main objectives of the stakeholder consultation are:

- To inform local people about the goal and objective of the proposed project
- To make people know about the components of the proposed project.
- To aware people about the problems that could be created from the proposed project.
- To obtain suggestions (mitigation measures, enhancement measures, contingency measures, compensation measures) to resolve those problems
- To confirm that all the affected parties and stakeholders have been adequately consulted and have been part of the various decision-making processes.

8.3 Identification of Stakeholders

Stakeholders include all those who affect and are being affected by policies, decisions or actions within a particular system. Stakeholders can be groups of people, organizations, institutions and sometimes even individuals. Stakeholders can be divided into primary and secondary stakeholder categories.

Primary Stakeholders

Primary stakeholders are people who would be directly benefited or impacted by a certain project intervention. In case of the proposed Project, the primary stakeholders include the people fall under the direct impact area and those who reside within and in the immediate vicinity of the project area. The primary stakeholders of the Project include PGCB, farmers, the owners of households to be impacted, small business community as well as Shopkeepers, pedestrians and students. Primary stakeholders identified and consulted

during the present ESIA study include communities to be benefitted and/or affected by the Project.

Secondary Stakeholders

This category of stakeholders pertains to those who may not be directly affected but have interests that could contribute to the study, play a role in implementation at some stage, or affect decision making on Project aspects. In this Project, concerned government departments and line agencies fall under this category.

Secondary stakeholders for the Project include local government institutions (LGI) like City Corporation, Union Parishad; other government agencies like KGDCL; CWASA; BTCL; civil society representatives, NGOs and general public at large.

The following table 8.1 presents the identified stakeholders at a glance-

Table 8.1: Stakeholders Involved into the project

Sl.	Type of stakeholders	Stakeholders
1	Primary	Land Owners, HH owners, small business community, shopkeepers, pedestrians, students women group,
2	Secondary	City Corporation, Union Parishad, KGDCL, CWASA, BTCL, civil society representatives, NGOs and wage laborer

Source: CEGIS, 2018

8.4 Approaches

Getting feedbacks from the affected stakeholders (considering all project phase), participatory approach was followed for conducting the public/stakeholder consultation meetings and other consultation sessions (through KII and GD) to provide project information and build awareness among various stakeholders about project intervention:

- ✓ A checklist was used to maintain uniformity and relevancy in discussion and in properly recording the opinions and views of the participants;
- ✓ Socio-Economic, agricultural, hydrological, fisheries, and ecological issues were discussed in detail, including potential impacts of the interventions on the environmental and social parameters;
- ✓ Institutional issues were also discussed regarding which the participants provided their opinions and suggestions freely.

8.5 Methodology

Regarding the aspect to involve respective stakeholders, consultation conducted through Public Consultation Meeting (PCM), Key Informant Interview (KII), Focus Group Discussion (FGD) and Group Discussion (GD) in relation to the project objectives within this project-affected area (Chattogram City Corporation).

During the period of the ESIA study, nine (9) consultation sessions were held with the respective stakeholders and received their feedbacks about the proposed project impacts and benefits.

At the very beginning of each consultation meeting, a representative from CEGIS (study team member) presented the whole activities related to the project construction. At the same time, the purpose of this study described briefly in which stakeholders can understand the importance of this Public Consultation Meeting (PCM). After getting an overview and project activities, Project Affected People (PAPs) started sharing their concern in terms of working time, compensation, probable risks, working environment and period of implementation.


Figure 8.1: 4 no Ward Counselor Office, Chattogram

Figure 8.2: Madunghat substation

Figure 8.3: Khulshi substation


Figure 8.4 Consultation at substation location

Figure 8.5: Photo Captured during the Public Consultation Meeting at 8 No ward under the CCC

8.6 Schedule of Consultation Meeting

Table 8.2: Schedule of Consultation Meeting

Sl	Place	Type of consultation	Date	Focal Person
1	Khulshi Substation	Formal	15-11-16	Sub, Assistant Engineer
2	Modunaghat Substation	Formal	15-11-16	Sub, Assistant Engineer
3	4 No Word Counsel Office, Chottagram	Formal	16-11-16	Word Counselor
4	Khulshi Substation	Formal	16-04-17	Executive Engineer
5	Modunaghat Substation	Formal	17-04-2017	Executive Engineer
6	Barashat Union Parishad (Beside the parishad)	Formal	18-04-2017	UP Chairman
7	Pahartali Word Counsel Office	Formal	19-04-2017	Word Counselor

8	Madarsha Union Parishad	Formal	19-04-2017	Word Counselor
9	8 no ward of CCC (Lake view Hotel)	Formal (PCM)	31.10.18	Shopkeepers

8.7 **Identified Issues during the Period of ESIA**

In Public Consultation Meeting local people mentioned that the proposed project may create some problems along with a number of benefits. Participants expressed positive attitude to the project and demanded its rapid implementation for purpose of strengthening power system. Local people expect that laborers (if needed) will be employed on the basis of skill levels from the study area during implementation and operation phases.

The local people also expressed concern that it may become difficult and risky to cultivate under this high power line, particularly during the rainy season. It may also create problems for cattle rearing in the year around. Member of local government institute shared that some *khas* land are available adjacent to the proposed substation area, in this regard it was requested to prefer *khas* land avoiding private land. It was also opined that the compensation process is very complicated make people scared about getting compensation properly.

As the findings of a Public consultation Meeting (PCM) following issues found from the attended stakeholders.

Findings of PCM

- Co-ordination should be ensured among the Chattogram City Corporation (CCC), Chattogram Development Authority (CDA), Chattogram Water and Sewerage Authority (CWASA), Power Development Board (PDB), Power Grid Company Limited (PGCB), Chattogram Gas Authority in respect of development related master plan in which public hassle regarding the project construction.
- A project approved to enlarge existing road and its beautification from Bahaddarhat to Kalurghat. No activities will be allowed after the completion of this project. Therefore, it is required to complete all activities before the implementation of recently passed project of CCC (road network beautification from Bahaddarhat to Kalurghat
- All Project Affected People (PAPs) should be aware through formal notification or letter with the detailed work plan before the project implementation.
- Considering the PAPs condition and traffic movement on the right of way, all project activities and construction should be conducted at night.
- As this construction will be conducted for UGSS cable routes, which would make hindrance for the movement of vehicles and people's movement. Regarding this aspect, carpeting should be completed in which people and vehicle can move during the day time.
- No pharmacy wouldn't be closed as they provide life savings drugs for the patients of adjacent hospital
- A fence should be provided by the PMU using proper safety sign and symbols.
- The Compensation would be provided to the selected PAPs (based on the survey results) should be provided in which they can manage their regular cost in case of emergency closing of road side shops.
- The disbursement of compensation should be provided to the selected original PAPs following the National rules and regulations before the project implementation.

- Top soil due to the construction should be cleared regularly as this area is congested due to traffic movement and pedestrian's movements.
- Considering the water logging situation of Chattogram City Corporation, no construction would be allowed during the Monsoon period.
- Some areas of the proposed area regular construction activities for sewerage and gas pipe lines are continued. In this respect, this construction would be completed in association with CWASA and Gas companies and others Govt. and private institution in which people's hassle during their movement can be reduced.

Suggested Measures against the Arising Problems

A combined Table on multidisciplinary problems and solution found in formal and informal discussion is presented in following **Table 8.3**.

Table 8.3: Identified Problems and Suggested Solutions

Issues	Problems	Suggested Solutions
Socio-economic	Permanent loss of arable land due to the construction of Substations would make a loss in agricultural for the landowners.	Ensuring proper compensation for acquired land and compensation for crop as well.
	Traffic Congestion in city area due to underground transmission line	Introduced a new approach road or bypass road for uninterrupted hassle free movement.
	Drainage congestion in city area due to underground transmission line and substation location	Integrated drainage system should be approached throughout the city in collaboration with Chattogram WASA, City corporation and respective gas distribution company.
	Children and women would feel insecure during construction and post construction of the project.	Social safety and security would be ensured in construction and post construction phase. Avoiding accident and unusual events during tower and new substation construction, stringing of transmission line which may affect peoples' health especially for women and children during construction work, a safety plan and its implementation would be ensured and monitoring activities also would be enhanced.
	Lack of Co-ordination among the all development authority's (i.e. CWASA, LGED, PGCB etc) made a regular hassle for the inhabitants of Chattogram City Corporation (CCC)	- A comprehensive coordination plan and the implementation of projects should be ensured. - Construction activities should be completed in coordination with related stakeholders to reduce the public hassle
Ecology	Terrestrial vegetation	Design project activities to run comparatively barren

Issues	Problems	Suggested Solutions
	would be damaged due to installation of substations especially at Khulshi and New Mooring proposed substation sites, towers and, transmission lines area. Grid maintenance may impede augmentation of trees to the peripheries of project/subproject.	area where possible to minimal damage of the aforementioned vegetation.
	Habitat loss of tiny wildlife spectacularly tiny birds, amphibians and reptiles due to implementation of substations, towers and stringing transmission cables.	Create microhabitats adjacent to the project locations before initiate project's civil works.
Fisheries	N/A	N/A
Agriculture	Majority of proposed Anowara substation site is three cropped. If possible this land might be shifted.	• Nearby fallow location of khas land might be brought in to cultivation • Proper land compensation should be ensured.
Physical and Water Resources	Road Condition will be deteriorated due to the movement of heavy construction equipment	Effective traffic management plan must come into force to minimize the damage

8.8 Future Consultation Plan for PGCB and Contractor

The stakeholder consultation is a continuous process, and should be maintained throughout the project. The consultations carried out during the present ESIA and reported in this Chapter are essentially a first step in this process. During the subsequent project phases as well, participation of the project stakeholders need to be ensured. In this regard a future framework for consultation has developed.

Table 8.4: Future Consultation Guideline

Consultation stages	Locations for consultations	Stakeholders	Facilitating party	Objectives	Activities
Before starting the construction activity	• Respective Union Parishad Office • Respective Councillor office • Local Project Office • Shops & social gathering places • In every four km distance of UGT	• Identified PAPs • Unon CouncilChairman and Members • Ward Councillors of Chottogram city corporation • Shop keepers • Other local people	• Contractors	• To build a congenial environment with local stakeholders intending to sooth completion of construction activities • To inform local stakeholders about the project construction activity • To resolve issues like compensation, resettlement and other associated social problems during construction stage, which cannot be solved through GRM.	• Arrange consultation at a well-known and easily communicable places • Informed the participants about the projects and activities • Publish leaflets and flyers containing project related information to distribute to the local stakeholders • Announcing the project through miking as well as through local satellite channel
Once every week during construction	• Respective Union Parishad Office • Respective Counsellor office • Local Project Office • Shops & social gathering places • At construction sites • In every four km distance of UGT	• Market associations • Temporary Shopkeepers • Local people	• PGCB and Contractor		• Arrange consultation at a well-known and easily communicable places • Informed the participants about the construction schedule and activities • Publish leaflets and flyers containing project related information to distribute to the local stakeholders • Announcing the project through miking as well as through local satellite channel • Documentation of the meetings through meeting minutes

At every stage of the consultation and communication process the identified stakeholders need to be informed, the entire consultation process (including methodology and approach) must be documented showing when and where the consultations were held (participants list for consultations carried out for the purpose of this ESIA are annexed); the issues and topics discussed as well as responses, feedback and suggestions must be documented.

8.9 **Participant Lists**

A list of participants who were present in different stakeholder meeting is presented in Appendix III

9. Screening of Environmental Social Impact

Screening of Environmental Impacts for Substations (SS):

Table 9.1: Environmental Impacts of the selected Substations (SS) subprojects.

Sl. No.	Subproject Site/Route	Common/General Impacts	Subproject Specific Impacts
01.	Khulshi230/132/33 kV GIS Substation	1. Pre-Construction Stage ▪ Land Acquisition 2. Construction Stage ▪ Impacts on soil ▪ Loss of crop ▪ Land use • Clearing of vegetation • Disturbance of wildlife close to the project area • Dust particulate production • Sound emission ▪ Air quality will be deteriorated ▪ Noise level will be increased ▪ Interference with Road Crossing and Traffic Congestion ▪ Waste will be generated from construction site ▪ Water may be polluted 3. Post construction stage ▪ Vegetation may be affected due to trimming or cutting ▪ Habitats for wildlife may be disturbed ▪ Noise generation ▪ Electro-magnetic Field	▪ Clearing of vegetation of a flower garden ▪ Noise level will be increased due to construction activities ▪ Interference with Road Crossing and Traffic Congestion while stringing wires through underground along the road would cause some interference with road crossing and traffic congestion for the construction period while movement of equipment carrying vehicles to construction sites, temporary traffic congestion would also occur ▪ Construction waste will be generate that would create hazard to the surroundings. ▪ Discharge of waste water to the open space will deteriorated the environment of the surroundings.
02.	New Mooring 230/132 kV GIS Substation		▪ Impacts on soil ▪ Loss of crop ▪ Land use ▪ Clearing of existing vegetation ▪ Dust particulates generated from transport and labors ▪ Sound emission from construction machines ▪ Air quality will be deteriorated due to emission dust from construction activities ▪ Noise level will be increased due to construction activities ▪ Movement of equipment carrying vehicles to

Sl. No.	Subproject Site/Route	Common/General Impacts	Subproject Specific Impacts
			construction sites, temporary traffic congestion would also occur ▪ Construction waste will be generate that would create hazard to the surroundings. ▪ Discharge of waste water from construction site and from the labour shed will deteriorated the surface water.
03.	2 x 230 kV GIS Bay extension at Madunaghat Substation		▪ Land Use ▪ Noise level will be increased due to construction activities ▪ Interference with Road Crossing and Traffic Congestion while stringing wires through underground along the road would cause some interference with road crossing and traffic congestion for the construction period ▪ Construction waste will be generate that would create hazard to the surroundings. ▪ Discharge of waste water to the open space will deteriorated the environment of the surroundings.

Table 9.2: Environmental Impacts of the selected Underground Transmission Line (UGT) subprojects.

Sl. No.	Subproject Site/Route	Common/General Impacts	Subproject Specific Impacts
01.	Anowara-New Mooring 400 kV double circuit: 25.6 km (Underground 5.25km)	1. Pre-Construction Stage ▪ No impact 2. Construction Stage ▪ Soil quality ▪ Noise level will be increased ▪ Interference with Road Crossing and Traffic Congestion ▪ Waste will be generated from constriction site ▪ Surface water pollution	▪ Soil quality ▪ Noise level will be increased due to construction activities ▪ Interference with Road Crossing and Traffic Congestion while stringing wires through underground along the road would cause some interference with road crossing and traffic congestion for the construction period ▪ Construction waste and

		▪ Environmental Pollution ▪ Income Loss ▪ Community Health and Safety ▪ Public Utility 3. Operation stage ▪ No Impact	excavated earth will be generate that would create hazard to the surroundings. ▪ Discharge of waste water and oil or any spillage from the construction of river crossing tower may pollute the Karnafuli river water. ▪ the construction work for underground cable may create traffic congestion .
02.	LILO of Hathazari-Rampur 230 kV at New Mooring: 2.66 km doublecircuit underground cable		▪ Soil quality ▪ Noise level will be increased due to construction activities ▪ Interference with Road Crossing and Traffic Congestion while stringing wires through underground along the road would cause some interference with road crossing and traffic congestion for the construction period ▪ Construction waste and excavated earth will be generate that would create hazard to the surroundings.
03.	MadunaghattoKhulshi 230 kV double circuit Underground cable transmission line: 14.6 km		▪ Soil quality ▪ Noise level will be increased due to construction activities ▪ Interference with Road Crossing and Traffic Congestion while stringing wires through underground along the road would cause some interference with road crossing and traffic congestion for the construction period ▪ Construction waste and excavated earth will be generate that would create hazard to the surroundings. ▪ Discharge of waste water and oil or any spillage from the construction of underground transmission line may pollute the nearby Halda river water. ▪ Public Utility e:g; gas, water pipe line may be disrupted. ▪ Even Chattogram city is full of

			dust due to construction of flyovers throughout the city. So this construction work especially underground cable route throughout the city will be reason for pollution

Table 9.3: Environmental Impacts of the selected Overhead Transmission Line (OHT) subprojects.

Sl. No.	Subproject Site/Route	Common/General Impacts	Subproject Specific Impacts
01.	Anowara-New Mooring 400 kV double circuit line:25.6 km (Overhead 19.347km)	1. Pre-Construction Stage ▪ No Impact 2. Construction Stage ▪ Impact on soil ▪ Loss of crop ▪ Land use change ▪ Waste will be generated from constriction site ▪ Interference with Road Crossing and Traffic Congestion ▪ Community Health and Safety 3. Operation stage ▪ No Impact	▪ Impact on soil ▪ Loss of crop ▪ Land use change ▪ Interference with Road Crossing and Traffic Congestion while stringing wires along the road would cause some interference with road crossing and traffic congestion for the construction period ▪ Construction waste will be generate that would create hazard to the surroundings. ▪ Community Health and safety might be disturbed due construction of overhead transmission line over the household and agricultural land

Air Pollution: The proposed work for construction of new sub-station, Bay extension and improvement of the existing sub-station and installation of transmission tower will emission of dust and also generate minor amount of air pollution from combustion of fuel of vehicles used for supplying cables and equipment. These will impact the ambient air quality which will minor and will reversible to baseline condition after completion of construction activities.

Noise level: During each phase of construction of the Substation and transmission line, some additional noise will be generated by the construction equipment and related activities. The increased noise level may cause health hazard such as disturbance in sleeping, create anxiety, hearing impairment etc. of the workers as well as of the local people around the project area. In particular, the settlements near the work areas will be exposed to noise and vibration generated by the project activities.

Interference with road crossing and traffic congestion: There will be disruption in movement of people and local transports in crossing points of rural roads and regional highways during stringing the transmission lines. Besides, traffic congestion will occur due to construction of underground transmission line and movement of equipment carrying vehicles to construction sites.

Wastes at project site: Construction wastes will be generate in the construction site of substation and tower sites that will create hazard to the surroundings. Such activity will also impact the environmental quality in and around the project area.

Impacts on Water: water quality will be deteriorated due to discharge of waste water from construction sites. Surrounding water bodies may be polluted if waste water not managed properly.

Impact in soil: The project interventions mainly construction of over head tower as well as underground transmission line may affect the soil quality temporarily. In carrying out these works, the valuable topsoil and sub soils will be disturbed and likely to be displaced. As a result, the soil quality may be degraded for supporting the agriculture crops in future.

Loss of crop: The agricultural practices of the areas will be hampered during mobilization, stringing and construction of work. Standing crops in the vicinity of the over head tower and Right-of-Way areas of the transmission line will be disturbed temporarily during construction period. The crop production loss will depend on duration and timing of work. The crop production in sub-station areas will be stopped permanently.

Land use change: The present land use practice will be changed in overhead tower footing and sub-station area.

Clear vegetation of flower garden: The proposed substation at Khulshi is an existing flower garden needs to be clear before commencing construction works. The periphery of the garden is beautified with broadleaved small plants. Similarly, some vegetationoccurs to the periphery of New Mooring site also requires removal of vegetation.

Disturbance of wildlife: The tiny wildlife exist in the proposed substation areas and/or close to substations especially Khulshi and New Mooring will get disturbance due to stockpiling of construction material, labor movement, and light at night in these project areas.

Dust particulate generation: During construction work, vehicle movement will generate dust particulate to the construction yard and beyond.

Sound emission: Construction of the substations will require mixture of construction material. In addition, other activities in favor of construction also require machines and machines will generate sound emission in these project sites.

Land acquisition and requisition: One proposed new substation would require approximately 18-acreland, which will be acquired by another project funded by the World Bank. However, the construction work will be carried out under this project.Moreover,153 decimals of land will be required for footing area of all (56) Towers. In this regard, acquisition of agricultural land is considered here as an important social component (ISC).

Traffic congestion: As Chattogram is one of the busiest and most important businesses center in Bangladesh, which results in heavy traffic load. Moreover, construction work for a flyover in the city is ongoing. As a result, it is anticipate that the construction work for underground cable may create traffic congestion. Therefore, traffic congestionis taken as an important social component here.

Community health and safety: community health and safety would be an important issue because of rapid movement of vehicles and other accessories during construction phase. Outsider's incoming from different areas for tower installation and maintenance can make people frightened in terms of movement and working during construction phase. In this regard, community health and safetyis considered as important social component.

Occupational health and safety: During construction activities, there are accidental risks coming out from several hazards or events associated with different types of construction activities. Therefore, occupational health and safety is considered as an important social component here.

Labour issues: According to the international and local laws and policies, child and forced labour are not allowed in the working premise. In spite of this, the contractors may recruit child and forced labour because of cheap wage rate. The recruitment of outsider labourer on the one hand may raise occupational conflict with local laborers; on the other hand, it may be an issue for health concern such as spreading of HIV/AIDS and contagious diseases by the outsider labourers. Therefore, these issues related to labour is considered as an important social component.

Cultural resources: Although there are no visible cultural resources, but there might be cultural remains under the ground, which could be discovered while underground construction work. According to national law, this cultural remain is the state property and requires immediate notification to the competent state authority. Therefore, it has been considered as an important social component.

Public utility: The construction work may affect public utility connections such as water supply, gas distribution, telecommunication etc., which eventually may interrupt the utility services. Therefore, public utility is considered as an important social component.

10. Potential Environmental Impacts and Mitigation Measures

10.1 **Environmental Impact Matrix**

Pre-construction Phase								
Land Acquisition	Moderate	Local	Reversible	Likely	Medium	Moderate	• Proper compensation should be given to the entitled land owner(s) according to the provisions of existing laws of Bangladesh. • Employment opportunity for the adversely affected people should be provided by engaging evacuees in the project construction activities. • Affected people should get proper compensation in terms of grants/allowances for the land acquisition and replacement of the structure. • Proper replacement should be ensured for the affected structures.	**Low**
Construction Phase								
Deterioration of Air Quality	Short term	Local	Reversible (after construction phase)	Certain	Low	Medium	• Water should be sprayed on road and material stockyards • Temporary fencing at construction sites should be done • Construction material should be covered with thick polythene while transporting	**Low**
Generation of Noise and Vibration	Short term	Local	Reversible (after construction phase)	Certain	Medium to high	Medium	• Movement of material carrying vehicles should be restricted/ limited during the day time. • Noise levels from vehicles, equipment and machinery should comply with national noise standards • Use of PPE (ear muffs and plugs) to labor should be ensured;	**Low**

							• Vehicles and machinery should have proper mufflers and silencers.	
Interference with road crossing and traffic congestion	Short term	Local	Reversible (after construction phase)	Likely	Medium	Medium	• Stringing wire work should be done in the early morning • Scaffoldings should be placed over the crossing points of roads • Danger signs and public awareness are also required.	Low
Generation of wastes at project site	Short term	Local	Reversible	Likely	Medium	Moderate	• The surrounding areas of the project should be kept clean. • Signboards and public awareness are also required.	Low
Impacts on Water	Short term	Local	Reversible	Likely	Medium	Moderate	• Camp waste management plan (septic tanks, proper solid waste disposal etc.) should be prepared and implemented; • Location of labour shed, sanitary facilities should be far away from the river or khal. • Release of untreated wastes in surface water and on the ground should be prohibited and it should be discharge through the drainage or sewerage line. • Construction material, debris, and excavated soil/silt should not be allowed to enter in the water bodies.	Low
Vegetation damage	Long	Local	Reversible	Likely	Medium	Moderate	• Keep vegetative area untouched during stockpiling; and • Avoid vegetation loss as much as possible during earthwork as well as wire stringing.	Low
Wildlife habitat destruction	Long	Local	Reversible	Likely	Medium	Moderate	• Limit vegetation loss as much as possible; • Avoid construction work during breeding season and destruction of nest as wildlife habitats; and • Use low sound emitting machines during	Low

							construction; and • Avoid constructyion works at night to minimize disturbance to wildlife habitat.	
Land Use	Moderate (Lifespan of the project)	Local (within the project boundary)	Reversible (in tower location and ROW) Irreversible (in substations)	Likely	Medium	Moderate	• Fallow lands should be selected for the construction of towers and substations. • If avoiding is not possible, proper compensation should be introduced (for both standing crops and land).	Minimal
Impact on Soil	Moderate (Lifespan of the project)	Local (within the project boundary)	Reversible (in tower location and ROW) Irreversible (in substations)	Likely	Medium	Moderate	• The contractor should carefully dig the hole for construction of towers and civil work of the substation. • The excavated soils materials should be properly stacked for refilling the trench with soil by maintaining the sequence of the soil profile (i.e. Substratum–Subsoil– Topsoil). • The loosened topsoil's must be compacted well so that no erosion can take place. • The solid waste should be cleaned immediately after completion of the work	**Minimal**
Loss of crop	Moderate (Lifespan of the project)	Local (within the project boundary)	Reversible (in tower location and ROW) Irreversible (in substations)	Likely	Medium	Moderate	• The mobilization and construction work of the project should be carried out carefully, so that standing crop would not damage. • The project work might delay for allowing the farmers to harvest their standing crop. • The work should not be continued through the ripened crop fields. • The notice of tower construction will be circulated to the affected farmers before the starting of cropping season. • Adequate compensation should be provmoniided to the farmers / share croppers for loss of standing crop (if any) for substation, tower location and ROW.	**Minimal**
Traffic	Moderate	Local	Reversible	Likely	Medium	Moderate	• Construction works should be carried out	**Low**

Congestion							during rainy season. • Construction area must be well fenced. • Road excavation should be continued in planned way with uninterrupted traffic • An alternative or bypass road may be constructed for avoiding traffic congestion. (in this regards, see above: alternative traffic plan)	
Occupational health and safety	High	Local	Reversible	Likely	High	Moderate	• Use of Personal Protection Equipment (PPE); • Awareness of workers • Arrangement of firefighting equipment with training to the staffs from workers to officers; • Staff should be trained on emergency handling procedures; • Control hot work via Permit to Work from the responsible persons; • Adoption of fire safety for each of the equipment's and machinery subject to fire hazard; • Safe handling and storage of flammable chemicals and fuels; • Regular inspection and monitoring of pressure parts and units; • Compliance with the national Noise Control Rules and Regulations and IFC Occupational Health and Safety Standards; • Equipment to be used by competent operators; • Provision of equipment with low noise and vibration outputs where possible. • Consider suitable timing of the work to reduce disturbance;	

							• Appropriate choice of modern equipment and machinery to reduce noise; • Driver should strictly follow the traffic rules and regulations of the country; • Provision and use of high visibility clothing by workers	
Labour issues	Moderate	Local	Reversible	Likely	Medium	Low	• Must avoid recruitment of child and forced labour • Recruitment of local labour especially eligible labour from PAPs should be preferred • Create safe and free working place for women workers • Must include a policy and also do practice in addressing the HIV/AIDS and contagious diseases issue	
Cultural resources	Low	Local	Reversible	Likely	Low	Low	• As mentioned in Baseline Section, there is no visible significant socio-cultural in the study area. But, if there is any such resources discovered while excavation, the contractor must inform the PGCB first. The PGCB then will inform the local administrator preferably to Upazila Nirbahi Officer (UNO) of respective sub-district. It is the responsibility of UNO to take necessary action on behalf of the state.	
Public utility	Moderate	Local	Reversible	Likely	Medium	Moderate	• Consult with utility providing respective/concerned government departments such as: CCC, CWASA, CDA, KGDCL and BTCL before starting the construction activity. • Consult with utility service receivers such as: local people, shopkeepers etc.	
Post Construction Phase								
Vegetation	Short	Local	Reversible	Likely	Minor	Low	• Trim trees/branches without damagening	Negligible

damage							the main tree or habitat; and • Avoid unnecessary trimming to vegetation.	
Wildlife support/ habitat destruction	Long	Local	Reversible	Likely	Minor	Low	• Use insulated cables to avoid death of flying mammals.	Negligible
Land Price	Moderate	Local	Reversible	Likely	Medium	Low	• Land value would be selected with the consultation of respective stakeholders. • Land value /compensation of crops should be given properly through negotiation with specific stakeholders. • Land value would be provided directly and at time without following complicated procedure	**Negligible**

10.2 **Positive Impacts**

Employment Opportunity

Impact

In Bangladesh, the unemployment rate measures the number of people actively looking for a job as a percentage of the labour force. During construction period employment opportunities for both skilled and unskilled labor may have improved. So, proposed project would require workers for construction, accessories supplies etc. Some people will be got the chance of working with the proposed project.

Implementation Plan

- Make a list of directly affected people who lose their tree/ agricultural crops are interested to work during construction phase.
- Ensure local people's engagement and give the priority offering working facilities in project activity.

Regional and National Development

This power strengthening project at Chattogram would make connectivity with national grid ensuring sustainable power supply in different region of the country. Economic development of the country will be enhanced l through quality supply of electricity by reliable transmission line and SS is the vision of Power Grid Company limited Bangladesh (PGCB).

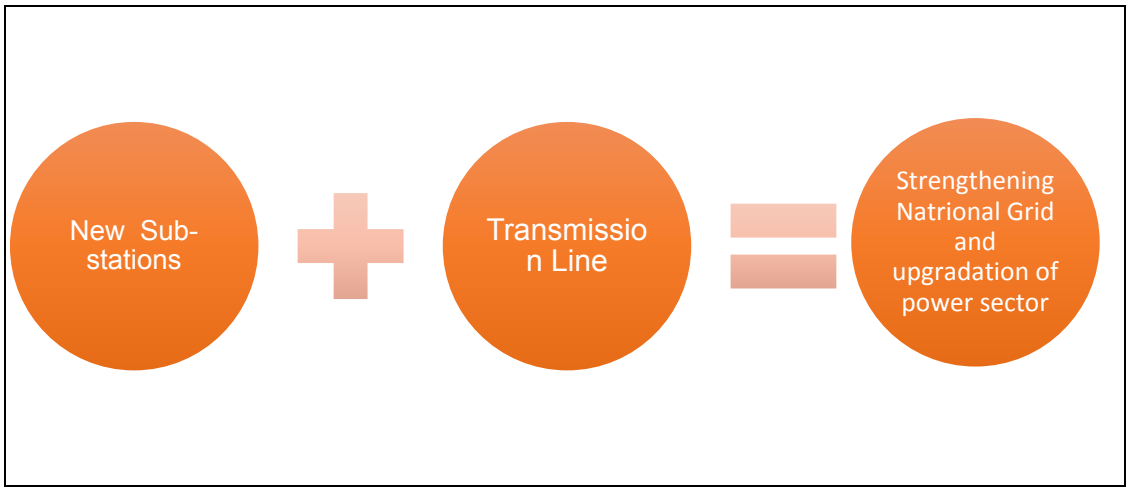


Figure 10.1: Role of New substation T/L line strengthening National Grid

This project will help to implement vision of Power Grid Company Bangladesh. Underground cable route is a new type of physical infrastructure in Bangladesh, though it is costly, it is beneficial in many respects National economy and growth is largely depended on the availability of electric power supply. Uninterrupted power supply would improve the productivity, which would affect the national growth and development. In this regard, national and regional development would be ensured after completing the whole construction work.

10.3 **Impacts during pre-construction stage**

Land Acquisition

Impact

This mega project consists of constructing one new substations and 42.26 km including 26 Km underground and 19.913 Km overhead line. In pre-construction phase, project proponent has to identify suitable place and acquire the land in a proper way.There are total 56 towers, for which 1.53 acres of land are needed to be acquired. Land compensation must be ensured to the affected land owners. There are two substations to be constructed and for this 18 acre of land is needed for one substation named New mooring substation and Khulshi substation will be constructed at the existing location. However New Mooring substation will be constructed under different project and will be upgraded to 230/132kv GIS substatio. Due to land acquisition, some arable land would be impacted in terms of construction of substation and stringing transmission line using those lands. According to the farmers, use of land for proposed substation and tower construction would affect land type of existing land that would have impact on the value of land in project. This would affect the socio economic condition of people in study area. ESIA data collected by CEGIS team shows that arable land would be used for the construction of Substation. These may reduce the agricultural production at the tower location and adjacent land price will be increased due to land development.

Mitigation

- Proper compensation should be ensured to the legal owner(s) according to the provisions of existing laws of Bangladesh.
- Employment opportunity for the adversely affected people should be provided by engaging evacuees in the project construction activities.
- Affected people should get proper compensation in terms of grants/allowances for the land acquisition and replacement of the structure.
- Proper replacement should be ensured for the affected structure.

Residual Impacts

With the help of above mitigation measures, the impacts associated with land acquisition is likely to be mostly addressed and the significance of residual impact will be low**.**

10.4 **Impacts during construction stage**

Air Quality

Impact

At present the quality of air is normal. Air quality will be deteriorated slightly for transportation of construction materials to the towers/ substation sites and civil works (land filling, foundation, RCC wok). Exhaust emission from the construction machineries and material carrying vehicles during construction activities will affect the ambient air quality. Further deterioration of ambient air quality of the locality will occurs due to land filling, foundation, RCC woks at substation sites. However the air pollution is temporal and reversible which will naturally return to baseline condition.

The significance of this potential unmitigated impact has been assessed as **Medium**on the basis of impact magnitude and receptor sensitivity.

Mitigation

The following mitigation measures should be adopted to address the above concerns:

- Water should be sprayed on road and material stockyards
- Temporary fencing at construction sites should be done
- Construction material should be covered with thick polythene while transporting.

Residual Impacts

The impacts associated with deterioration of air quality are likely to be adequately addressed with the help of above mitigation measures. Hence, the significance of residual impacts will be **Low**.

Noise Level

Impact

At present condition, noise level of the study area is within tolerable limit. No significant source of noise was found. It will deteriorate slightly by mobilization of construction materials, operation of equipment and machineries. For construction work at substation site, heavy equipment's will be needed which will produce noise. Mechanical equipment's would be required for land development and compacting and leveling of the base involves Roller and Compactor. Construction of other infrastructure requires a variety of different equipment's. All these activities will increase noise level and create discomfort to the workers and the surrounding receptors.However, the increased noise level during construction activities are temporal and reversible and eventually it will return to the baseline condition.

The significance of this potential unmitigated impact has been assessed as **Medium**on the basis of impact magnitude and receptor sensitivity.

Mitigation

The following mitigation measures should be adopted to address the above concerns:

- Movement of material carrying vehicles should be restricted/ limited during the day time.
- Noise levels from vehicles, equipment and machinery should comply with national noise standards
- Use of PPE (ear muffs and plugs) to labor should be ensured;
- Vehicles and machinery should have proper mufflers and silencers.

Residual Impacts

The impacts associated with noise level are likely to be adequately addressed with the help of above mitigation measures and hence the significance of residual impact will be **Low.**

Impact on Soil

Impact

During construction period, a big hole will be dug for civil work to construct overhead towers. The topsoil of the adjacent locations (IIA) will be covered with the topsoil, subsoil and substratum of the whole (tower location's soil). The covered topsoil of GIA will not be able to support agricultural crops properly due to unplanned deposition of outside soil. So soil quality of GIA will be degraded. Moreover the soil profile of the dug hole of tower locations will be altered when this hole will be refilled with the previously deposited excavated soils.

On the other hand, the liquid and solid waste might be produced from construction related works.
For underground transmission line similar scenario might be happen. But this area is not used for agricultural practice and will not create any problem for plant growth afterwards.
In substation locations, the total area will be acquired and will be converted to permanent structure. Similar scenario will happen in substation locations if proper measures will not be taken.
The significance of this potential before mitigation impact has been assessed as Moderate on the basis of impact magnitude and receptor sensitivity.

Mitigation
The following mitigation measures are being suggested to address the above concerns:

- The contractor should carefully dig the hole for construction of towers and civil work of the substation.
- The excavated soils materials should be properly stacked for refilling the trench with soil by maintaining the sequence of the soil profile (i.e. Substratum–Subsoil– Topsoil).
- The loosened topsoil's must be compacted well so that no erosion can take place.
- The solid waste should be cleaned immediately after completion of the work

Residual Impacts

The impacts associated with changes of soil quality are likely to be adequately addressed with the help of above mitigation and the significance of residual impact will be **Minimal**.

Wastes at Project Site

Impact

Construction wastes at substation site like sand, cement, stone, brick chips etc. would create obstacle to agricultural land, water bodies during construction period. The non-inert substances in construction waste those include bamboo, timber, vegetation, packaging waste and other wastes would create some potential impacts on the surrounding environment. In addition, keeping old wires at tower site (after replacing by higher size conductors)would create hazard to the surroundings.

The significance of this potential unmitigated impact has been assessed as **Medium**on the basis of impact magnitude and receptor sensitivity.
Mitigation

The following mitigation measures should be adopted to address the above concerns:

- The surrounding areas of the project should be kept clean.
- After replacing, old cables should be removed immediately from project site.
- Signboards and public awareness are also required.

Residual Impacts

The impacts associated with Wastes at project site are likely to be adequately addressed with the help of above mitigation measures and hence the significance of residual impact will be **Low.**

Impacts on Water

Impact

Surface water quality will be degraded due to discharge of waste water from the construction work at new sub-station site at new mooring and bay extension and improvement of existing sub-stations at Madunaghat and Khulshi and installation of transmission towers especially the river crossing towers. In addition, wastes from labor sheds and material stockyard may potentially degrade or pollute the both surface water and groundwater quality.

The significance of this potential unmitigated impact has been assessed as **Medium**on the basis of impact magnitude and receptor sensitivity.

Mitigation

The following measures should be implemented to address the above concerns:
Camp waste management plan (septic tanks, proper solid waste disposal etc.) should be prepared and implemented;
Location of labour shed, sanitary facilities should be far away from the river or khal.
Release of untreated wastes in surface water and on the ground should be prohibited and it should be discharge through the drainage or sewerage line.
Construction material, debris, and excavated soil/silt should not be allowed to enter in the water bodies.
Machineries should be properly maintained so that it would not release oil and grease beyond tolerable limit.

Residual Impacts

With the help of the above mitigation measures, the impacts associated with degradation of surface water quality are likely to be addressed appropriately. As such, the significance of residual impact will be **Low**.

Loss of Crop

Impact

The standing crops will be damaged in overhead tower locations and might be damaged in ROW. Besides this, heavy equipment's are used to dig and construct towers, which also make considerable loss to crop production. Around 27metrictons crop might temporarily be damaged due to the construction of overhead towers in tower location, of which 12 ton rice and 15 metric tons non rice crops. Approximately 1,347 metric tons crop might be in danger during construction stage in ROW, of which 675 metric tons rice and 672 metric tons non-rice crops. This crop will be loss annually in study area, if any accidental event takes place or unplanned construction will be done.
Besides this, 65.89metric tonscrop will be lost permanently in the substation area annually, of which 43.84metric tons rice and 22.05 metric tons non-rice crop.
No crop loss will be happen due to underground transmission line construction.
The significance of this potential before mitigation impact has been assessed as Moderate on the basis of impact magnitude and receptor sensitivity.

Mitigation

The following mitigation measures are being suggested to address the above concerns:

- The mobilization and construction work of the project should be carried out carefully, so that standing crop would not damage.
- The project work might delay for allowing the farmers to harvest their standing crop.
- The work should not be continued through the ripened crop fields.
- The notice of tower construction will be circulated to the affected farmers before the starting of cropping season.

Compensation:

- Adequate compensation should be provided to the farmers / sharecroppers for loss of standing crop (if any) for substation, tower location and ROW.

Residual Impacts:

The impacts associated with changes of crop production are likely to be adequately addressed

with the help of above mitigation and the significance of residual impact will be Minimal.

Land Use

Impact

The land use of overhead transmission tower locations will be changed temporarily due to the construction work. For 56 towers will be constructed, which will require around 1.53 acres land. This land could no longer be used as legs of the towers will be converted to non-agriculturalpermanent structure. The significance of this potential before mitigation impact has been assessed as Moderate on the basis of impact magnitude and receptor sensitivity.

Mitigation

The following mitigation measures are being suggested to address the above concerns:

- Fallow lands should be selected for the construction of towers and substations.
- If avoiding is not possible, proper compensation should be introduced (for both standing crops and land).

Residual Impacts

The impacts associated with changes of land use are likely to be adequately addressed with the help of above mitigation and the significance of residual impact will be **Minimal**.

Vegetation

Impact

During construction, different types of vegetation including herbs and shrubs would need to be cut. Similarly, stockpiling of construction material and preparation of construction yard needs some space. In this context, terrestrial vegetation would be damaged or cleared out especially in the RoW and partially in the GIA (General Impact Area) as well as substation sites. In this case, herbs and shrubs in some locations are anticipated to be damaged. Transmission lining in the urban area has been proposed to be underground. No vegetation damage will occur in the urban area but the rural area at Anowara will face damage to its cropland vegetation during transmission lining including tower installation.

Thus, the significance of this impact has been assessed as **Moderate**on the basis of impact magnitude and receptor sensitivity.

Mitigation

- Keep vegetative area untouched during stockpiling; and
- Avoid vegetation loss as much as possible during earthwork as well as wire stringing.

Residual Impact

With the support of the above-mentioned mitigation measures, impacts associated with road rehabilitation likely be addressed adequately and the significance of residual impact will be **Low**.

Wildlife and their habitats

Impact

The proposed transmission line in the urban area has been proposed to be underground. Therefore, no impact is anticipated in this area but substations proposed at Khulshi, and New Mooring would incur damage to some plants, and habitat of small wildlife. Mentionable damage will occur to Indian Coral Tree, Shialmutra, Common Duckweed, Black Drongo, Asian Pied Starling, and Red-vented Bulbul. In addition, labor movement and construction vehicles movement would cause damage to wildlife habitat (core habitat) adjacent to project area. Occasionally, noise generated from construction machines or by labors would have negative impacts to wildlife and their habitat, for which their movement may be disturbed and recstricted. In the aquatic ecosystem, the Ganges River Dolphin exist but will not be received negative impacts during construction of the towers as well as stringing of the wires of the transmission lines in the both banks of the Karnafuli River because light boat/vessel will use during strinbging of wires. Hence, no disturbance will occur during construction works.

Thus, the significance of this impact has been assessed as **Moderate**based on impact magnitude and receptor sensitivity.

Mitigation

- Limit vegetation loss as much as possible;
- Avoid construction work during breeding season and destruction of nest as wildlife habitats; and
- Use low sound emitting machines during construction; and
- Avoid construction works at night to minimize disturbance to wildlife habitat.

Residual Impact

With the support of the above-mentioned mitigation measures, impacts associated with road rehabilitation likely be addressed adequately and the significance of residual impact will be **Low**.

Interference with Road Crossing and Traffic Congestion

Impact

Currently, Chattogram city is full of traffic due to construction work of flyover. Now the construction work for underground cable route through the city region will exacerbate already extreme traffic situation in Chattogram city. Even the local people are anxious about this condition. Representative of local government and administration also expressed their anxiety. However, there is no impact on road crossing and traffic congestion during pre-construction and post-construction phase of implementation.But, while stringing wires through underground along the road would cause some interference with road crossing and

traffic congestion for the construction period. Besides, movement of equipment carrying vehicles to construction sites, temporary traffic congestion would also occur.

Mitigation

- Construction works should be carried out after rainy season.
- Project area must be well fenced but it must be well planned so that entry to any shops is not blocked.
- Road excavation should be continued in planned way.
- A bypass road may be introduced for avoiding traffic in busy spots.
- Visible symbols, posters, sign etc are placed properly to aware the local passersby
- Scaffoldings should be placed over the crossing points of roads while stringing conductors.

Residual Impacts

The impacts associated with Interference with road crossing and traffic congestion are likely to be adequately addressed with the help of above mitigation measures and hence the significance of residual impact will be **Low.**

Community Safety and Security

Impact

Community safety and security would be impacted due to rapid movement of vehicles and other accessories during construction phase. The incoming of outsiders from different areas for tower installation and maintenance can make people, especially women and children frightened in terms of movement and working during construction phase.Besides, theoverhead transmission lines go over structures such ashomesteads, commercial spaces and temporal establishment as well.

Mitigation

- Social awareness for safety measure before starting construction work would be ensured at respective locality.
- Build approach roads avoiding locality for ensuring social safety during construction phase of that project.
- Try to avoid route of overhead transmission line that goes over the households if possible. If it is not feasible then it is to be ensured that height of overhead transmission line is properly standardized and ensuring proper security for households.

Residual Impacts

With the help of above mitigation measures, the impacts associated with Traffic Congestion is likely to be mostly addressed and the significance of residual impact will be **Moderate**.

Occupational Health and Safety (OHS)

Impact

There are accidental risks coming out from several hazards or events associated with different types of construction activities. The following table shows the type of hazards/ Event/risks, along with their sources and consequences for workers:

Table-: 10.2 Occupational health and safety issues during construction stage

Hazard / Event/risks	Source(s)	Consequence(s)
Struck by	Falling/moving pipe, tools/ debris dropped from elevated location, vehicles;	Health injury and loss of life
Falls	Fall from elevated areas, towers, high heights etc.	Health injury and loss of life
Electrocution	Cutting and welding, cable gallery, switchyard etc.	Health injury and loss of life
Fire and Explosion	Cable gallery, power transformer, switchyard, switchyard control, flammable chemical, power transformer, etc.	Health injury and loss of life
Noise Pollution	Noise and vibration from heavy machinery and civil construction work;	Hearing complexity, scaring to wildlife, livestock, human being, etc.
Traffic Accident	Onsite and offsite;	Health injury, life loss, property damage etc.
Unsafe Working Place	Lack of safe working condition, employee having contagious disease;	Health injury, electrocution, organ disease outburst, loss of health, loss of life

Mitigation

- Use of Personal Protection Equipment (PPE);
- Awareness of workers
- Arrangement of firefighting equipment with training to the staffs from workers to officers;
- Staff should be trained on emergency handling procedures;
- Control hot work via Permit to Work from the responsible persons;
- Adoption of fire safety for each of the equipment's and machinery subject to fire hazard;
- Safe handling and storage of flammable chemicals and fuels;
- Regular inspection and monitoring of pressure parts and units;
- Compliance with the national Noise Control Rules and Regulations and IFC Occupational Health and Safety Standards;
- Equipment to be used by competent operators;
- Provision of equipment with low noise and vibration outputs where possible.
- Consider suitable timing of the work to reduce disturbance;
- Appropriate choice of modern equipment and machinery to reduce noise;
- Driver should strictly follow the traffic rules and regulations of the country;
- Provision and use of high visibility clothing by workers

Residual impact

With the help of above mitigation measures, the impacts associated with occupational health and safety are likely to be mostly addressed and the significance of residual impact will be **low**.

Labour Issues

Impact

According to the international and local laws and policies, child and forced labour are not allowed in the working premise. In spite of this, the contractors may recruit child and forced labour because of cheap wage rate. The recruitment of outsider labourer on the one hand may raise occupational conflict with local labourers, on the other hand, it may be an issue for health concern such as spreading of HIV/AIDS and contagious diseases by the outsider labourers.

Mitigation measure

- Child Labors will be strictly prohibited. All employees must show birth certificate or national identification to confirm they are of age that is permitted under the law. The project proponent must include the clause to ensure no child labor is hired for any part of the entire project in the bidding documents.
- The project proponent must include a policy and also do practice in addressing the HIV/AIDS and contagious diseases issue.
- Recruitment of local labour especially eligible labour from PAPs should be preferred
- Create safe and free working place for women workers

Residual impact

With the help of above mitigation measures, the impacts associated with labour issue are likely to be mostly addressed and the significance of residual impact will be **low**.

Cultural Resources

As mentioned in Baseline Section, there is no visible significant socio-cultural in the study area. But, if there is any such resources discovered while excavation, the contractor must inform the PGCB first. The PGCB then will inform the local administrator preferably to Upazila Nirbahi Officer (UNO) of respective sub-district. It is the responsibility of UNO to take necessary action on behalf of the state.

Public Utility

Impacts

The construction work may affect public utility connections such as water supply, gas distribution, telecommunication etc., which eventually may interrupt the utility services.

Mitigation

- Consult with utility providing respective/concerned government departments such as: CCC, CWASA, CDA, KGDCL and BTCL before starting the construction activity.
- Consult with utility service receivers such as: local people, shopkeepers etc.
- Take necessary steps in avoiding interruption and obstruction in public utility services

Residual Impact

With the help of above mitigation measures, the impacts associated with public utility are likely to be mostly addressed and the significance of residual impact will be moderate.

10.5 **Impacts during Post construction stage**

Vegetation

Impact

The periphery of the proposed transmission lines and substation sites would regenerate vegetation like herbs and shrubs. Similarly, some landowners can be interested to plant fruit, timber and medicinal trees beneath the transmission lines or the peripheries of lines as well as substations. Such activities need trimming or cutting branches/trees for management of grid. Therefore, operation of lines and substations would pose negative impacts to the exisitng vegetation.

Thus, the significance of this impact has been assessed as **Low**on the basis of impact magnitude and receptor sensitivity.

Mitigation

- Trim trees/branches of tree without damagening the main tree or habitat; and
- Avoid unnecessary trimming to vegetation.

Residual Impact

With the support of the above-mentioned mitigation measures, impacts associated with road rehabilitation likely be addressed adequately and the significance of residual impact will be **Negligible**.

Wildlife and their habitat*

Impact

In this stage the migratory birds will not undergo any disturbance through project activities like installation of substations, transmissions lines and tower installation for transmission because the flight height of the migratory birds is 15000 meter or above the ground.On the other hand, the gaps between transmission cables are sufficient to pass resident birds. Therefore, the project would not have any negative impact to migration. But, the flying mammals (Indian Flying Fox) might be caught/electrocution with wire during their movement. On the other hand, the tower of transmission lines would provide support to birds for resting and nesting because towers are usually high enough and out of human disturbance. In addition, birds like kites, eagles, etc. may select towers to build their nests in order to provide parental care of their offspring.

Thus, the significance of this impact has been assessed as **Low**on the basis of impact magnitude and receptor sensitivity.

Mitigation

- Use insulated cables to avoid death of flying mammals.

Residual Impact

With the support of the above-mentioned mitigation measures, impact associated with wildlife habitat likely be addressed adequately and the significance of residual impact will be **Negligible**.

Noise

Impact

Post construction noise will mainly generated from cooling fans, generators operating in an emergency situation and transformer humming. In extremely rare cases, some maintenance activities may require welding and cutting which will temporarily generate noise.

Mitigations

If generators are used, they should be placed inside temporary enclosed compartment to reduce noise and at the same time with adequate ventilation to ensure the generators do not heat up. Cutting fluids can significantly reduce shrill noise generated from cutting machines. Ear-plugs should be used by the employees when deemed required. Low noise generating cooling fans should be used. Transformers with low humming noise should be procured.

Residual Impacts

No notable noise except for generator noise, which will be in extremely rare situation, and only in emergency situations.

Electro-magnetic Field (EMF)

Impact

The project does not have any High Voltage Direct Current (HVDC) part in it. As for the AC voltage level up to 400kV parts of it, the impact of EMF will be well below the occupational and public exposure levels set by International Commission on Non-Ionizing Radiation Protection (ICNIRP) standards for 50Hz systems.

Mitigation Measures

Not Required

Residual Impact

Not Applicable

Operation and Maintenance of Waste (SS)

Impact

Substation wastes such as transformer oil, used battery, machine oil, post maintenance cleaning debris and fluids can seep to the ground and deteriorate the soil and ground water as well as surface water through the waterways and drainage system of the sites.

Other wastes are municipal wastes that are generated due to occupancy by the employers and other workers.

Mitigation Measures

Cleaning should be done with appropriate health safety and environmental friendly procedure. Storage tanks and storage facilities should be used to store any fluid or material that is detrimental to the environment and health.

The substations should have appropriate facilities to store and then make arrangement for regular takeaway to dispose of the machine and maintenance wastes.

Municipal wastes should be managed by the local municipal waste authority and for that, the project proponent should make arrangements with the local authorities.

Residual Impact

None

11. Social Impact Assessment

11.1 Socio-Economic Resources

Socio-economic condition refers to social and economic factors accruing to an individual or group and is mainly measured by income, education, occupation and many other variables. In this chapter socio-economic condition of the study area is discussed. Demography, economic condition, working condition and many other indicators are the main components of this chapter. Some data collection tools like Focus Group Discussion (FGD), semi structured questionnaire, Key Informant Interview (KII) and were used to collect data from primary source. Relevant secondary information was collected from the Community Report of the Population and Housing Census 2011 published by Bangladesh Bureau of Statistics (BBS) in 2015.

11.2 Administrative Bounding of the Study Area

The study area includes twenty five (25)Union*Parishads* [14] of eight (8) Upazillas/Thanas in Chattogram District. Administrative boundary was analyzed by spatial Geographic Information System (GIS). The study area along with their administrative locations is givenbelow**(Table 11.1)**

Table 11.1: Administrative boundary of the Study Area and Area Coverage (In Percentage) by Union and Paurashava

District	Upazila/ Thana	Union	Area Percentage
Chattogram	Hathazari	Burish Char	100%
		DakshinMadarsha	
		Shikarpur	
	Patiya	Bara Uthan	
		Char Lakshya	
		Jiri	
		Juldha	
		Sikalbaha	
	Chandgaon	Ward No-04	
		Ward No-05	
		Ward No-06	
	Panchlaish	Ward No-07	
		Ward No-08(part)	
	Khulshi	Ward No-08(part)	
		Ward No-09(part)	
		Ward No-13	
		Ward No-14	
	Kotwali	Ward No-15 (Part)	
	Halishahar	Ward No-26	
	Chattogram Port	Ward No-37	
		Ward No-38	
		Ward No-39 (Part)	

Source: CEGIS spatial analysis, 2017

[14] Union *Parishad* is the lowest administrative tier in Bangladesh

11.3 **Demography**

There are 1,471,531 people (Population and Housing Census 2011) comprising of 286,816 households. The male and female population is respectively 761,599 (51.8%) males and 709,932 (48.2%) females. The sex ratio of male and female of these unions is 107, meaning there are 107 males for 100 female. From the demographic table (Table 11.2), Kotwali Upazila has the highest sex ratio, which is 115:100 (male 115, female 100). The average population density of the study area is 4,285. Panchlaish is the most densely populated area where 8,801people live per square kilometer. As Chattogram is a division and a port city, therefore, people from different regions move to the area in search of jobs that also culminate into a massive population.

Table 11.2: Demographic Data of the Study Area

Upazila	Household	Population	Male	Female	Sex Ratio	Population Density
Anowara	14830	78432	39378	39054	101	1848
Patiya	30293	163822	83306	80516	103	2744
Hathazari	13762	69607	34012	35595	96	4002
Chandgaon	54949	256411	132054	124357	106	3375
Panchlaish	43918	214988	112927	102061	111	8801
Khulshi	60800	278623	148536	130087	114	5309
Kotwali	10672	51603	27634	23969	115	3787
Halishahar	10376	52999	27741	25258	110	5239
Chattogram Port	47216	208260	105919	102341	103	3464
Total/Average	286816	1374745	711507	663238	107	4285
Projected Population[15]		1471531	761599	709932		

*Source: Population and Housing Census 2011, BBS, 2012 *Estimated to 2017*

11.4 **Household Size**

Data from the Population and Housing Census 2011 shows that most households in the study area (about 72.9%) have four or more members. The average household size of 5 (4.9) members is similar to the national average of 4.44.

11.5 **Age Structure**

Age structure breakdown shows that the group of 30-49, regarded as the economically active population, forms the largest segment at 23.7%. The group of 60 and above is relatively smaller compared to others.

[15] $Pop_{Future} = Pop_{Present\ (1+r)}^{n}$

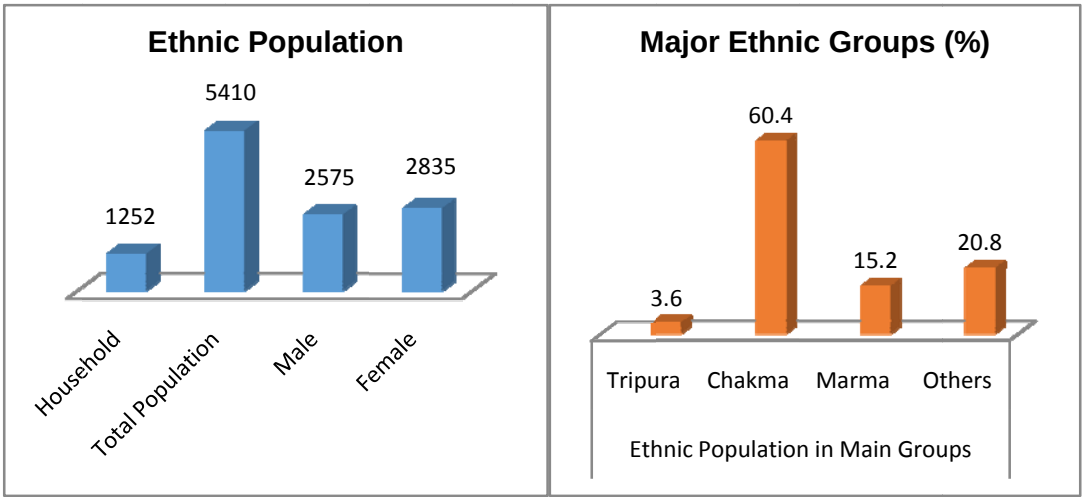
Where: Pop_{Future} = Future Population, $Pop_{Present}$ = Present Population, r = Growth Rate and n = Number of Year

11.6 Dependency Ratio

This indicator is measured by the number of population aged below 15 or above 64 divided by the number of populations aged 15 to 64 and expressed as percentage. The average dependency ratio in the study area is 36% (Source: calculations from Population and Housing Census 2011), or almost 36 persons are dependent on 100 working people. The national dependency ratio (% of working-age population) is 52%, according to the World Bank[16].

11.7 Ethnic Community

It is an established fact that many ethnic communities and groups live the Chattogram region. Primary data accounted for 1,252 ethnic households with 5,410 members, out of whom 2,575 male and 2,835 female. The three biggest ethnic communities in the study area are the Chakma, Marma and Tripura.



Source: Population and Housing Census 2011, BBS, 2012

Figure 11.1: Ethnic Population and Major Ethnic Groups

The Out of the total population of 5410, Chakma consists of 3267 people and Marma consists of 823 people. Members of other groups, such as the Mro, Murong, Pankho, Tanchangya, Khumi, Bom were also identified and classified as Other category. However, it has been verified that there are no ethnic communities found in the AOI (Area of Influence) of the project.

i) Literacy Rate

The average literacy rate in the study area is 64.6%, higher than national average of 61.5%. Gender-segregated literacy rates are also higher than national average.

ii) Access to Health Facilities

Primary surveys reveal that 34% of the people have access to a paramedic physician and 41% to a trained physician. People reported a tendency to go to a local healer (22%) for treatment. 3% people (mostly the poor) do not have access to any medical facilities

iii) Employment Opportunity

16http://data.worldbank.org/indicator/SP.POP.DPND?view=map

Data shows that about 45.8% of the population (age 7+ not attending school) is employed in different sectors of which 32.6% are male and 13.2% are females. 30.7 % of the women are engaged in household work. The study area has an unemployment rate of 21.8%. It is found that almost 0.70% of total population (age 7+ not attending school) including 0.5% male and 0.20 % female is actively seeking employment.

11.8 Main Occupation

Study area consists of urban regions where most of the employed adults are engaged in service-oriented jobs. 63.6% people, including 48.06% male and 15.54% female, are engaged in the service sector. 28.31% people, including 15.39% male and 12.92% female, are engaged in the industrial sector. A very small portion of people (8.1%) are engaged in the agricultural sector. It is particularly noteworthy that women's participation in income generation activities in the study area is 28.84% of total population (Population aged 7+, not attending school and employed) and they are mainly employed in service sector.

Primary survey reveals a significant numbers of emigrants who send remittances back to their families. Chattogram area attracts people from different parts of the country in search for work or business.

i) Availability of Labor and Wage Rate

A compatible wage rate is prevalent in the study area and is presented in following Table 8.3. In summarizing this Table 11.3, it is found that wage rate is almost same in every union in our study area, but the wage rate is quite higher than other regions since the port city offers enhanced economic opportunities. Primary survey data reveal that women wage rate is comparatively lower than male.

Table 11.3: Availability of Labour and Wage Rate of the Study Area

Type of Activities	Type of labor	Availability	Wage (Taka)	
			Max.	Mini.
Farming	Male	High	400	300
	Female	Medium	350	300
Non farming	Male	High	500-600	400
	Female	Low	350	300

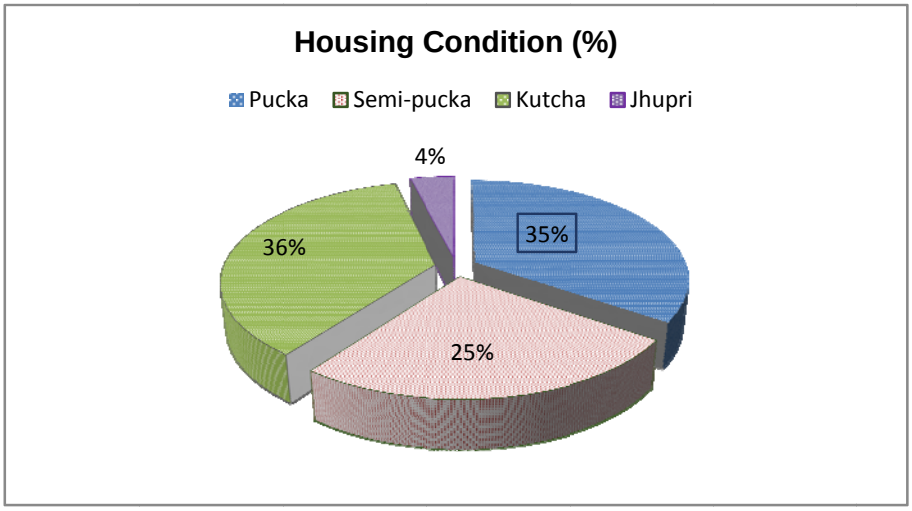
Source: CEGIS' Field visit, 2017

ii) Migration

Seasonal human migration is very common in agricultural cycles. The trends of seasonal migration depend on availability of work, natural disasters, industrialization and development initiatives affecting land and natural resources. Seasonal labor migration is common phenomenon where cultivable land remains under water during rainy season so rural poor people struggle for their livelihood. But in our study area seasonal migration occurs for categories, as it is a port area. It is found that labor is from different regions of the country. Even different national and multination organizations have their corporate branches in Chattogram city. Primary survey data revealed that there are small numbers of international out migrants (about 5%) that tends to go to Middle East.

11.9 Housing Condition

Housing condition in the study area is characterized by 35% pucca[17] and 25% semi pucca households[18].The highest number of (36%) houses are kutcha[19] and Jhupri[20] is negligible in number. The scenario of housing condition is now changing with increasing income of the study area in Figure 11.2.



Source: Population and Housing Census 2011, BBS, 2012

Figure 11.11: Housing Condition in the Study Area

i) Drinking Water Facility

Quality In the study area, 56% of people are dependent on tube-well as their main source of drinking water. Here large number of people (38%) depends on tap water although they are used to boiling water before drinking. Tap water is mainly found in urban and sub-urban area. Negligible people use other sources like ponds, river etc. for drinking water. Field findings reveal that salinity is found in ground water especially at the coastal region (Anowara substation area).

ii) Sanitation Facility

17Pucka: House which is made by fully concrete, cement, and iron.

18Semi-pucka: Walls: Bamboo mats, CI sheet, Timber or bamboo framing. In some areas wall are made by earth, sometimes part or full brick. Foundation: Earthen plinth; Brick perimeter wall with earth infill; Brick and concrete also use. Roof: CI sheet with timber or bamboo framing

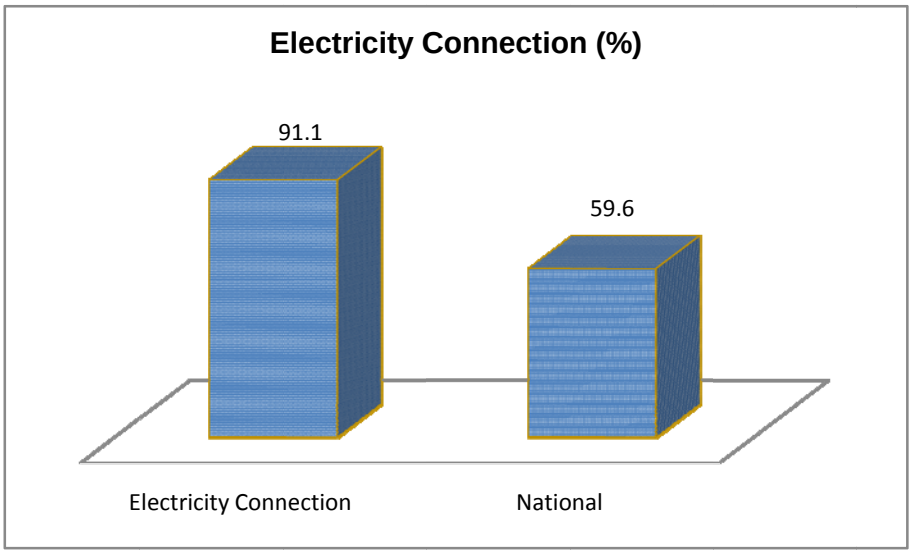
19Kutcha: Walls: Organic materials like jute stick, catkin grass, straw, and bamboo mats. Split are bamboo framing. In some areas wall are made by earth. Foundation: Earthen plinth with bamboo or timber posts. Roof: Thatch-rice or wheat or maize straw, and catkin grass, with split bamboo framing;

20Jhupri: House which consist mud walls of 1.5 to 3.0 ft thickness, which carry the roof load. Earthen floor, thatch or CI sheets are used as roofing materials. There is no monolithic joint between the wall and the roof.

In the study area, 79% households reported that they have sanitary toilet facilities of which 37% are water-sealed and another 42% are not water-sealed. A big portion (19%) of household this study area has non-sanitary toilet facility. Still 2% households have no sanitation facility.

iii) Access to Electricity

Electrification rates for the study area is 91.1%, much higher than the national average of 59.6%.



Source: Population and Housing Census 2011, BBS, 2012

Figure 11.3: Electricity Facility in Study Area

11.10 Land Price

The land prices of different type of lands have been taken from the ESIA field visit. People of different areas, occupations, ages have provided indications about the land price. The areas are mostly in urban areas and as a result land price is higher. The average land prices in the different areas is presented below. It is seen that commercial and homestead land price is higher as well.

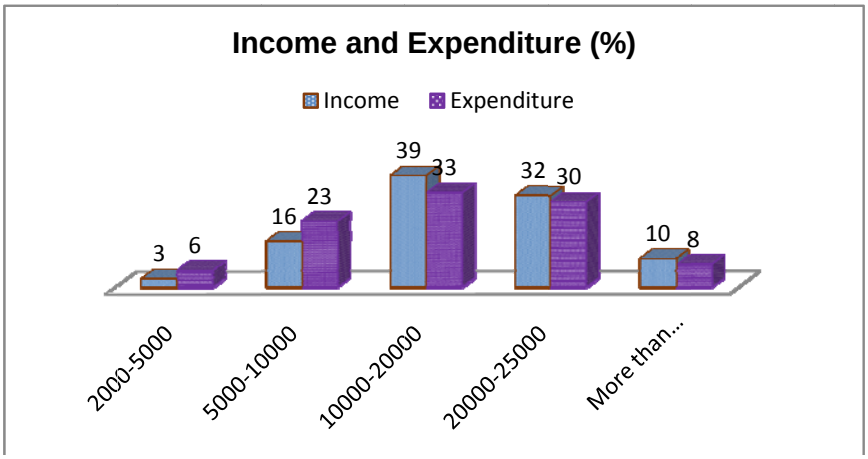
Table 11.4: Land Price of the Study Area

Land classes	Minimum - Maximum Land Price (Taka/Decimal)
	At Present (2017)
Agricultural land	100,000 – 150,000
Homestead land	500,000 – 750,000
Commercial land	1,200,000 – 1,500,000

Source: CEGIS field work, 2017

11.11 Income and Expenditure

Household Primary data on income and expenditure suggests that households in the lower income groups are spending much more than their income, thus saving practically nothing and are potentially in a debt trap. Households with income above Tk. 10,000 and above have indicated some savings. This trend increases with households in higher income brackets. The scenario of income and expenditure is shown in the following Figure 11.4.



Source: CEGIS field work, 2017

Figure 11.14: Distribution of Household by income and Expenditure

i) Self-Assessed Poverty

The poverty profile has been prepared by the participants of the RRA themselves through a self-assessment exercise. The assessment is based on the year-round income along with the food consumption by the inhabitants within three different categories namely deficit, balanced and surplus. It is observed that about 19% of the households on average are under the poverty line, 23% are above the poverty line and the remaining 59% in the "balanced" situation.

11.12 Project Related Information

11.12.1 Public Utilities

Public services taken into consideration for this report are water supply, sanitation, solid waste management, electricity supply, telecommunication etc. It is expected that utilities will not be interrupted during the construction of the substations and overhead transmission lines. Certain services maybe interrupted due to the excavation for the underground cables from Madunaghat to khulshi 230 kV. Field visits confirmed the existence of water supply lines and secondary drainage adjacent to the alignment of RoW.

11.12.2 Cultural Resources

The CEGIS field team has visited both substation and ROW of transmission line. No cultural resources and sensitive spaces are found in the alignment and the proposed location of substation. Proposed substation at Khulshi will be constructed at open space of Khulshi substation; New-mooring substation location is under BWDB ownership; the Anowara substationis located in an agricultural land though this SS is not under the project.

The proposed Madunaghat to Khulshi underground transmission line will cross through roadsides and there are no temples residents, temples etc found at the alignment though this is the busiest road of Chattogram. At least one mosque and a family graveyard are found in the RoW of Madunaghat to Khulshi underground transmission line. A special access to these places needs to be ensured through wide wooden planks with hand railings. Contractor must ensure this during construction phase.

11.12.3 Land required for project Intervention

The following table indicates the total land requirement to implement the project interventions.

Table 11.5: Land requirement for implementing the project

Serial No	Subproject	Land required (acres)
1	400 kV transmission lines: 25.182 km Anowara – Anandabazar (New Mooring) 400 kV double circuit	1.53
2	230 kV transmission lines: 17.22 km (2.66 km LILO, 14.56 km. UGT)	
3	230/132 kV GIS substation at Anandabazar (New Mooring) with transformer of 2×350/450 MVA	18
4	230/132/33 kV GIS substation at Khulshi with transformer of 2×350/450 MVA (230/132kV) and 3×80/120MVA (132/33 kV).	-
5	Bay extensions: 2 Two 230 kV GIS substation at Madunaghat substation	-
	Total land required:	1.53

For the tower footing of overhead Transmission Line, 1.53 acres of land is required and will be acquired. Under the Country system, the land is used for public purpose and the landowner is compensated for crop loss and restoration of topsoil. No land is acquired for underground Transmission Line, as these TLs will be constructed under the ground of the road side. Commercial establishments temporarily disrupted due to excavation will be compensated.

18 acres of land will be required for construction of the 230/132 kV GIS substation. Although the construction of this substation will be carried out under this project, the required land will be assembled through another project named "*Enhancement and Strengthening of Power Network in Eastern (ESPNER of Bangladsh"* funded by the World Bank.

However, no land is required for the new substation proposed to be constructed at Khulshi, as this substation will be constructed at the existing location. No land is required for Bay extension at Madunaghat Substation, as this will also be constructed at the existing substation.

Currently, the required land proposed above has no human settlement and no displacement will take place for the land acquisition/requisition. Therefore, no resettlement/Resettlement Action Plan (RAP) is needed for this project.

11.12.4 Baseline condition of the Project Affected People

For analyzing baseline condition of the project affected people a sample survey (See Appendix IV) was carried out in account with some major socio-economic indicators. Temporal disruption for overhead and underground transmission line was the main concern for this section.

11.12.5 Underground Transmission Line

A sample survey was conducted to reflect the background of the PAPs affected by the underground transmission line. The sample comprised of a total of 230 numbers of project affected people of which 201 were permanent shopkeepers and 29 were temporary or mobile shopkeepers.

Age Structure

Analyzing Primary data shows that the age categories for most of the temporarily affected people are between 30-49 years. For Permanent establishments the percentage is 62.7 and 62.1 for the temporary establishments. This age group is the most economically active segment of the population. Table 11.6 shows the breakdown per age and type of impact for PAP.

Table 11.6: Age structure of PAP's for underground Transmission Line

Age Category	Percentage	
	Permanent	Temporary
20-24	4.5	6.9
25-29	10.9	13.8
30-49	62.7	62.1
50-59	15.4	13.8
60-64	3.0	0.0
65+	3.5	3.4

Source: CEGIS field survey, 2018

Household Size

Most PAP households consist of 5 members. This is almost same for both permanent and temporal shopkeepers. Average family size is 4-6 members, compared to national average of 4.4.

Table 11.7: Household size of PAP's for underground Transmission Line

No of Family Members	Percentage	
	Permanent	Temporal
3 Members	5.5	13.8
4 Members	23.4	17.2
5 members	32.3	34.5
6 Members	18.9	20.7
7 Members	11.9	6.9
8 Members	4.0	6.9
9 Members	2.5	0.0
10 Members	1.5	0.0

Source: CEGIS field survey, 2018

With Most PAP households consist of 5 members. This is almost same for both permanent and temporal shopkeepers. Average family size is 4-6 members, compared to national average of 4.4.

Land Ownership of the Affected Shops

Generally temporary shops are mobile in nature: some shops move frequently i.e. daily, while certain shops are situated in fixed locations, but are temporary and informal in nature. Permanent shops here refer to fixed structures. The following data show that most of the shops (178 nos.) are privately owned, 19 (9.5%) shops are operated by property owners, while the remaining 159 shops (79.1%) are rented out. 23 shops (all of them temporary and informal) are situated on the state-owned khas land without having legal permission from the

government, therefore, can be termed informal commercial establishments with no legal sanctity. Data shows that 6 temporary shops are operated on rental basis and owned by private owners (Table 11.8).

Table 11.8: Land ownership of PAP's for underground Transmission Line

Type of Ownership/ Occupancy	Total No	Percentage
Encroacher/ Occupier	23	11.5
Rented Shopkeepers	159	79.1
Legal Proprietor	19	9.5

Source: CEGIS field survey, 2018

Daily Income

The shops are categorized into three: small, medium and large in terms of income range. Thus, shops with daily income ranges from BDT 1,000 to 8,000 are lumped into 'small' category, and daily income ranges from BDT 8,000 to 20,000 is lumped into 'medium' category. Conversely, shops with daily income more than BDT 20,000 is considered 'large' category. Following these categories, data reveals that most of the affected shops (64.2%) belong to the small category, to which all temporary shops are included. Conversely, the permanent shops belong to medium and large categories. The profit margin of these shops varies regarding type of shops. The daily average margin for small shops is around BDT 1500, for medium around BDT 2500, and for large BDT 4500. The budget for compensation has been prepared based on the profit margin rather than total daily income

Table 11.9: Daily income Range of the PAP's for Underground Transmission Line

Categories (Income Range)	Total No	Percentage	Daily average profit margin (BDT)
Small (1000-8000)	129	64.2	1500
Medium (8000-20000)	55	27.4	2500
Large (20000+)	17	8.5	4500
Total	201	100	

Source: CEGIS field survey, 2018

11.12.6 Overhead Transmission Line

For the Overhead Transmission Line, 78 households were found throughout the RoW of 20m. In this section, baseline information of these surveyed households is presented.

Age Structure

Most of the respondents (65.4%) of these suryed households belong to age ranges between 30 to 49 years old. This implies the higher presence of economically active population in the study area.

Table 11.10: Age structure of respondents of households throughout the Overhead Transmission Line

Age Category	Total No	Percentage
20-24	2	2.6
25-29	3	3.8
30-49	51	65.4
50-59	13	16.7
60-64	5	6.4
65+	4	5.1
Total	78	100

Source: CEGIS field survey, 2018

Household Size:

Of the surveyed households, 35.9% includes 4 members, and 21.8% includes5 members. The following table indicates the details of household's family members. However, no disable member was found in the households located in the RoW of overhead transmission line.

Table 11.11: Household size of PAP's for Overhead Transmission Line

No. of Family Members	Total No	Percentage
3 Members	6	7.7
4 Members	28	35.9
5 Members	17	21.8
6 Members	9	11.5
7 Members	10	12.8
9 Members	4	5.1
10 Members	4	5.1
Total	**78**	**100**

Source: CEGIS field survey, 2018

Occupation:

The following table represents the occupational variation of the study. Most of the households are dependent on firming activities. Some are doing business. Some households are found as well where household head resides outside the country. The following table represents the occupational variation of affected households.

Table 11.12 Occupational Variation of Overhead Transmission Line

Occupation	Total No	Percentage
Business	25	32.1
Day Labor	7	9.0
Farmer	28	35.9
Housewife	4	5.1
Job	11	14.1
Immigrant	3	3.8
Total	78	100

Source: CEGIS field survey, 2018

11.12.7 Alternative Traffic Plan

During construction period for the underground transmission line an alternative Traffic Management Plan will be worked out to avoid traffic disruption. Construction work will be executed in consideration of the busy traffic of both vehicles and pedestrians in appropriate times of the day to limit disruption. Road excavation should be carried out in a segmented way with clear traffic signs, reflectors, etc. to ensure advanced warning. But during excavation period it may create problems at night and day though traffic is quite poor at night Contractor should carry out some specific measures to avoid any accidental incidents. Before any excavation or saw cutting work near traffic lights the utility operator and/or Contractor must liaise with the Corridor Manager to verify the location of cables and detector loops. Contractors must take appropriate steps to keep excavations free of water, to minimize risks associated with rainfall and subsoil drainage along with this the size of the Work and the Road portion of the site is kept as small as is reasonably possible and working location must be well fenced and kept covered with some planks for avoiding accidental incidents. In this regard a guideline is prepared for EPC contractor (Chapter -12).

11.13 **Access Restrictions:**

During the construction phase of the underground transmission line from Khulshi to Madunaghat, certain areas' access may be disturbed and/or restricted. Alternative access to shops, mosque and common places will be provided by the contractor with the provision and installation of appropriate wooden planks with hand-railings. Provision of alternative access is the responsibility of the contractor and is budgeted as an EMP item.

11.14 **Impact on Livelihood**

Impacts Impacts due to Project interventions were assessed through engineering design, ocular inspection and field surveys conducted from 20th to 27th October 2018. Upon the finalization of the detailed engineering design, the RPF and the full RP (Resettlement Plan) will be updated to include newly available impacts and mitigation. All entitlements will be paid prior to the commencement of civil works.

Based on the preliminary assessment, the Anowara-New Mooring 400 kV double circuit overhead transmission line (OHT) will include agricultural land, settlement area, river, and pond. There are residential (76) and commercial (1) structures and family graveyard (1) of 78 households respectively, 3 large scale commercial enterprise including a government organization under the 20m strip of this OHT RoW (19.932km). There is no physical and economic displacement due to the Project.

The OHT will also have permanent (in tower footing area) and temporary (outside tower footing area) impacts on crops in the RoW. The OHT will have a permanent impact on trees by necessary felling or trimming in the RoW. Presently the laws of Bangladesh do not permit acquisition of land under towers or in the RoW; as such temporary crop impacts and tree impacts are captured herein.

The Project is expected to impact businesses, commercial entities and public spaces by the installation of the RoW of Anowara-New Mooring 400 kV double circuit underground transmission line (UGT - 5.25km) and LILO 230 kV double circuit UGT (2.659 km). The summary impacts are shown in Table11.13-11.14 below.

Table 11.13: Summary of OHT interventions and their impacts

OHT Interventions	Details
Length of OHT RoW (km)	19.932
Number of River Crossing Towers (RT)	2
Number of Angle Towers (AT)	16
Number of Suspension Towers (ST)	37
Number of Terminal Tower (TT)	1
Total towers (RT, AT, ST & TT)	56
Total area in the OHT RoW (acre)	98.5
OHT Impacts	
Total households in the RoW	78
Total households with residential structures in the RoW	76
Total households with commercial structures (poultry farm) in the RoW	1
Total households with family graveyard in the RoW	1
Number of persons expected to be affected due to RT, AT & TT (land & crop impacts)	265
Commercial Enterprises	2
Agricultural land (in acre) under the RT, AT, ST & TT (permanent crop impacts) for tower footing (20m)	1.53
Agricultural land (in acre) in the OHT RoW (temporary crop impacts) (20m)	70.3
Agricultural land (in acre) outside the OHT RoW (temporary crop impacts tentative) (80m)	394.02
Trees in RoW (20m)	2396

Source: Initial field survey for the study, 2018

Table 11.14 Summary of UGT interventions and their impacts

UGT Interventions	
Total length of UGT RoW (km)	22.47
Anowara-New Mooring	5.25
LILO of Hathazari-Rampur	2.66
Madunaghat -Khulshi	14.56
UGT Impacts	
Business entities (mega permanent shops) expected to be affected (number)	96
Business entities (medium permanent shops) expected to be affected (number)	162
Business entities (small temporary shops) expected to be affected (number)	307
Total business entities expected to be affected (number)	565
Taking into account of 10% increase of the numbers	57
Grand Total	622

11.15 Impact on Land in the OHT RoW

The construction of 56 towers and installation of OHT will be carried out on private agricultural and homestead land, rivers, khals and so on (see Table11.15).This land will not be subject to permanent acquisition, as per the laws of Bangladesh. However, impacts on crops, structures, trees are considered in this RPF entitlement matrix.

Table 11.15 Use of land in the OHT RoW

Land use	Area in acre
Single crop	41.0
Multiple crop	29.3
Settlement	19.6
Rivers and khals	5.0
Built-up non-linear	2.0
Orchards and other plantations (trees)	1.53
Fresh water aquaculture	0.07
Total	98.5

Source: Remote sensing image used for the study, 2018

Installation of the OHT (19.932 km x 20m) temporarily requires 98.5 acres of land within RoW and 394.02 acres of land outside the RoW for stringing, establishment of workshop and work sites temporarily during construction. Construction of 56 towers (16 angle towers, 37 suspension towers, 2 river crossing towers and 1 terminal tower) requires 1.53 acres of land in the RoW.

The angle and terminal towers (19 = 16+2+1) will be installed on agricultural land. The exact location for suspension towers is yet to be finalized. Estimated potential losses will be compensated and are included in the entitlement matrix. Impacts, however, on structures, crops, trees in detail are presented in the subsections below.

11.16 Affected Residential Structures in the OHTRoW

In 76 (seventy-six) households and their respected residential structures situated in the RoW of OHT will be affected. These households use the affected structures for their own dwelling purposes. The type of the structures based on their construction materials are presented in Table 11.16 below.

Table 11.16Affected residential structures by type in the ROW

Sl	Type	Number
1	Pucca	28
2	Semi pucca	37
3	Tin made (roof & wall)	52
4	Tin made (roof only)	1
5	Hut	130
6	Total	

11.17 Affected Commercial Structures in the OHT RoW

Within the OHT RoW commercial structures belong to (i) a poultry farm of a household and to (ii) Karnaphuli Fertilizer Company Ltd (KAFCO), a larger commercial enterprise. Other than these there is a Marine Workshop of Bangladesh Shipping Corporation (government organization) also under the OHT. Production of these commercial entities and activities of the Marine Workshop will not be affected as protection measures will be undertaken for stringing of overhead cable.

11.18 Temporary Loss of Crops in the OHT RoW

The affected land is mostly agricultural (>70%), with the diversified crops. Hybrid Aus and summer vegetable is grown in Kharif-I season while HYV Boro and winter vegetable is grown in Rabi season. Only HYV Aman is grown in Kharif-II season. Therefore, the single cropped land grows only HYV Aman in Kharif-II season (41 acre). Among the multiple cropped area 14.1 acres of land is triple cropped while 15.2 acre of land is double cropped. Due to water logging, crop cultivation is not possible in double cropped area in Kharif-II season.

Total 239 metric tons crop is cultivated in the RoW. Among these crops 119 metric tons is paddy and 120 metric tons is crops other than paddy. Paddy contains Hybrid Aus (14 metric tons), HYV Aman (83 metric tons) and HYV Boro (22 metric tons) while crops other than paddy contains summer vegetables (28 metric tons) and winter vegetables (92 metric tons). Compensation for loss of crops will be paid to the affected persons and is considered in the R&R budget . The total land area being considered for crop loss is 70.3 acres in the RoW for stringing (see Table 11.17). Farmers will not be able to cultivate for one season in the RoW area during construction. The land under the towers (1.53 acre for four feet) after construction of the transmission line will no longer be useful for crop cultivation; the surrounding area of the tower footing will lose its fertility. Crop compensation of tower footing area (1.53 acres) is considered for four crop seasons, one season is for crop loss during construction and additional three (3) seasons for resettlement benefit of the permanent loss of crop in the tower footing land. For budget estimate purposes 265 households are anticipated to be affected in the angle and terminal tower area calculated based on the khatian data information. Besides, some places in 394.02 acres of land outside the RoW (80m) will be affected during stringing, construction of workshop and work sites; one season crop loss in that area, therefore, is considered. But the area to be required/affected specifically in 80m RoW for stringing and construction of workshops is unknown (at this stage), the cost for crop loss of this area is included in unforeseen cost estimate in the resettlement budget of this RPF.

Table11.17: Cropping pattern in the OHT RoW

Cropping Patterns			Area (acre)	% of NCA
Kharif-I	**Kharif-II**	**Rabi**		
HybridAus	HYV Aman	HYV Boro	8.8	13
Fallow	HYV Aman	Winter Vegetables	15.2	22
Fallow	HYV Aman	Fallow	41.0	58
Summer Vegetable	HYV Aman	HYV Boro	5.3	8
Total			70.3	100
Cropping Intensity %			**162%**	

Table 11.18: Crop production in the RoW of OHT

Crop Name	Crop Area (ha)	Crop Yield (ton/ha)	Crop Production (tons)
Hybrid Aus	3.6	3.8	14
HYV Aman	28.5	2.9	83
HYV Boro	5.7	3.9	22
Total Rice	37.7		119
Summer Vegetables	2.1	13	28
Winter Vegetables	6.2	15	92
Total Non-Rice	8.3		120
Grand total	46.0		239

11.19 Loss of Trees in the OHT RoW

The initial survey indicates that there are 2396 trees (fruit and timber) on private land in the alignment (20m RoW). It is mandatory to remove and trim the trees in and adjacent to the RoW, respectively for ensuring safety. Different sizes and species of trees are anticipated to be affected within the RoW. Compensation for trees is considered in the budget of this RPF. The names of affected trees by number are presented in Table 11.19 below.

Table 11.19: Affected trees on private land by species and number

Type	Species	Number
Fruit	Mango, Coconut, Plum, Guava, Palmia Plam, Date Palm, Black Berry, Jackfruit, Litchi, Wood Apple, Lemon	448
Timber	Manhagoni, Rain Tree, Acasia,Blinding Tree, Chambol,Betel Nut, Lebbek Tree, Gum Arabic, Indian ash tree, Eucalyptus	1368
Medicinal	Indian lilac (*Neem*), *Arjun*	30
Groves/clumps	Banana	305
	Bamboo	245
Total	-	2396

11.20 Other Impact in the OHT RoW

There is a family graveyard (1) in the RoW of the proposed power transmission line. A household affected with residential structures has an aquaculture pond (0.07 acre) also in the RoW.

11.21 Affected Commercial Structures in the UGT RoW

The underground transmission line (UGT) installation may hamper movement of customers of business centers adjacent to the RoW of the proposed UGT. The UGT installation activities will be done segment wise and it is anticipated that approximately 14 days will be required at a time in a segment. There are 565 shops found along the UGT alignment during the initial survey; 258 of them are permanent and the remaining 307 are small temporary (some of them are portable/mobile/floating). The permanent structures are classified as mega and medium shops. The mega, medium and temporary small shops are defined in terms of their daily profit margin and type of structures. Mega shops refer to those shops that earn 4000 BDT or more than that per day as their profit, medium shops that earn 1500-4000 BDT/day as their profit, and lastly the small shops that earn less than BDT 1500/day. The income, however, of the mega, medium and small shops expected to be affected due to the Project are considered and hence their entitlement for income loss is also included in the entitlement matrix.

11.22 VulnerableHouseholds

The vulnerability assessment of the potentially affected households is not possible at this stage of assessment. Even though, entitlement is considered for the vulnerable households. As such the budget includes allowances for the vulnerable households in this assessment. Vulnerability impacts of the affected households will be confirmed once detailed design is

confirmed and census & inventory of losses survey is done based on that for full resettlement plan preparation.

11.23 Income and Livelihood Restoration

In accordance with the entitlement adopted in this Project, all affected households and persons will be entitled to a combination of compensation packages in cash and resettlement assistance depending on the nature of ownership rights on affected/lost assets, scope of the impacts including socioeconomic vulnerability of the affected persons and measures to support livelihood restoration if livelihood impacts are envisaged. The affected persons will be entitled to:

- Compensation for crop loss due to use of land within and along the OHT RoW;
- Compensation for land loss in the tower footing area of the OHT;
- Compensation for loss and damage of structures (if any) for construction and repairing;
- Compensation for trees to the owners at current market price;
- Assistance for loss of business income; and
- Special assistance to vulnerable households.

In sum, PGCB will provide compensation and assistance to the affected households to the extent possible to ensure that all affected households are compensated well before commencement of the civil works. There will be no physical and economic displacement in the OHT and UGT alignment. The affected households will be informed well ahead of construction work schedule (as per Act 2017 and Electricity Act 2018). PGCB will be involved through its PIU in meaningful consultation and participation with the affected people in Project implementation.

11.24 Resettlement Costs and Rehabilitation Cost and Budget

The estimated costs and budget for resettlement and rehabilitation (R&R) cover compensation on affected agricultural land, crops, structures, and trees. The costs of land (permanent damage) for the tower footing area as well as construction and repairing costs for structures, compensation for trees, crops and other resettlement benefits are estimated. This budget is an indicative outlay where the ownership information of the affected land is collected from local land office as per Dag/JL/Sheet numberduring field survey.

These costs estimate will be updated and adjusted once the OHT and UGT RoW is finalized based on recommendations of PVAC prior to the Project implementation. Replacement/compensation costs of all affected assets will be updated annually if the PVAC at the district level justifies the same before commencement of civil works for any considerable price escalation. There is also a budget allocation for R&R and a 10% contingency over the total budget to meet unforeseen expenditures. Therefore, this budget will remain as a dynamic process for cost estimate during implementation.

11.25 Calculation of Estimated Costs

The estimated costs for assets, especially for land which to be requisitioned for use based on replacement costs and compensation,are calculated on the basis of field findings. The

current government/mouza rate of land is consideredfor calculating the compensation for permanent damage of land in tower footing area of OHT. The current market price (CMP) of other assets to be affected complies with replacement value as per resettlement policy of the co-financier (AIIB). The CMP thus prepared will be reviewed, verified and determined by the PVAC. The PVAC rate will be paid by the Project as replacement value/compensation for affected assets.

11.26 Summary of Resettlement and Rehabilitation Budget

The total estimated cost and budget for R&R is BDT 179.87 million (USD 2.15million), which is shown in Table 11.20. This budget includes compensation for land, structures, standing crops and trees, and R&R benefits. Additional 200% premium on the mouza rate is considered for permanent land damage and 100%premium with crop production cost of BDT 750/decimal/season is considered for crop compensation. For calculating tree compensation cost of timber value of affected trees are considered from previous study namely – (Resettlement Plan (RP) of proposed Chittagong-Bakhrabad Gas Transmission pipeline Project). This budget also includes R&R operational costs and monitoring costs. Contingency costs are also calculated and incorporated in this budget.

Table 11.20: Breakdown cost of R & R budget for overhead and underground transmission line

SL	Head of Budget	Amount (dec/sft/Nos)	Rate in BDT	Estimated cost in million BDT
A	Compensation for permanent damage of land for tower footing	153	427,882	65.5
B	Compensation for crops production @ BDT 750/decimal/season including 100% premimun for tower footing area and RoW area	7,183	1500	10.8
Sub-total of (A to B)				**76.2**
C	**Compensation for Structure**			
C.1	Pucca (pucca floor) sft	4631	1301	6.03
C.2	Pucca (kutcha floor) sft	600	761	0.46
C.3	Semi-pucca (pucca floor) sft	3698	761	2.81
C.4	Semi-pucca (kutcha floor) sft	2548	729	1.86
C.5	Double-barreled tin house (pucca floor) sft	1502	729	1.10
C.6	Double-barreled tin house (kutcha floor) sft	2518	725	1.83
C.7	Tin house with only one slanting roof (pucca floor) sft	80	729	0.06
C.8	Tin house with only one slanting roof (kutcha floor) sft	2001	725	1.45
C.9	Kutcha (sft)	1526	651	0.99
C.10	Thatched (sft)	56	520	0.03
Sub-total of C		19160		**16.61**
D	**Compensation for loss of trees**			
D.1	Fruit trees	448	6000	2.7
D.2	Timber trees	1368	11300	15.5
D.3	Medicinal trees	30	9600	0.3
D.4	Bamboo	245	350	0.1
D.5	Banana	305	400	0.1
Sub-total of D				**18.6**
E	**Resettlement and Rehabilitation Benefits**			
E.1	Reconstruction grant @10% of non shiftable structures			1.1
E.2	Shiftable grant @5% of shiftable structures			0.3
E.3	Income restoration grant for 14 days income loss (@BDT4000x14) of each premanent shops (mega) for underground transmission	96	56000	5.4
E.4	Income restoration grant for 14 days income loss (@BDT2500x14) of each premanent shops (medium) for underground transmission	162	35000	5.7
E.5	Income restoration grant for 14 days income loss (@BDT1500x14) of each temporary shops for under ground transmission	307	21000	6.4
E.6	Cash grant for loss of agricultural income in the tower footing area equivalent to crop loss for three crop	153	4500	0.7

SL	Head of Budget	Amount (dec/sft/Nos)	Rate in BDT	Estimated cost in million BDT
	seasons			
Sub-total of E				**19.6**
10 % of Sub total E				1.96
F	Operation cost for R&R @4% of total from A to B			6.5
G	Monitoring cost @2% of total from A to B			4.0
H	Unforeseen cost for any other damages during construction			22.9
Sub total (F to H)				**33.40**
I	Contingency @10% of the sub-total (A-E)			13.50
Total Estimated Budget (In Million BDT)				**179.87**
Total Estimated Budget (in Million Usd)				**2.15**

Source: Field survey, CEGIS, 2018
Note: 1 US Dollar (USD) = 83.85 BDT as the exchange rate of Bangladesh Bank on 12th November, 2018

11.27 Assessment of Unit Value for Compensation

Details of the compensation cost estimation for land, structures, crops and trees are presented sequentially below.

11.28 Replacement Value of Land

Replacement value of land is calculated using the current mouza rate recorded in the Sub Registry Office (land) plus 200% premium with mouza rate. The average rate of land in the Project area by mouza name is presented in Table 11.21 below. The PVAC will finally decide the rates by types of land and location before commencement of the civil works under the Project.

Table 11.21: Average rate of land in Project area by mouza name

Mouza Name	Mouza rates (in BDT per decimal)
Dudkumar	29,296
Boirag	147,313
Chaturi	211,329
Koinpur	25,993
Dowlotpur	152,124
KaiGram	70,470
Sikolbaha	234,574
Chor lokkha	269,920
Average Mouza rate	**142,627**
Actual CCL including 200% premium	**427,882**

Source: Field survey, CEGIS, 2018

The replacement value of land for tower footing area is presented in Table 11.22. The OHT tower footing area in 19.932km RoW cover 1.53 acre (153 decimal) of land which incur permanent damage of land. The total estimated cost of land for permanent damage is about BDT 65.5million.

Table 11.22: Estimated amount of land compensation for the Project

Quantity in decimal	Actual rate in BDT per decimal	Total estimated cost(Million BDT)
153	427,882	65.5

Source: Field survey, CEGIS, 2018

11.29 **Cost of Structures**

The replacement and repairing (if needed) costs of the structures affected due to the Project is presented in Table 11.23. Total estimated replacement and repairing costsof the affected structures by typeare BDT 16.61million.

Table 11.23: Estimated compensation amount for primary structures

Sl. No.	Structure Type	Quantity in sft. /No.	Rate in BDT	Estimated amount of Compensation (in million BDT)
1	Pucca (pucca floor) sft	4631	1301	6.03
2	Pucca (kutcha floor) sft	600	761	0.46
3	Semi-pucca (pucca floor) sft	3698	761	2.81
4	Semi-pucca (kutcha floor) sft	2548	729	1.86
5	Double-barreled tin house (pucca floor) sft	1502	729	1.10
6	Double-barreled tin house (kutcha floor) sft	2518	725	1.83
7	Tin house with only one slanting roof (pucca floor) sft	80	729	0.06
8	Tin house with only one slanting roof (kutcha floor) sft	2001	725	1.45
9	Kutcha (sft)	1526	651	0.99
10	Thatched (sft)	56	520	0.03
Total (In Million BDT)		19160		**16.61**

Source: Field survey, CEGIS, 2018

11.30 Compensation for Crops

Compensation Compensation for standing crops in the tower area (including footing area) as well as in RoW is considering the market value as BDT 750 per decimal. One hundred percent (100%) premium is added with the CMP of crop following the government law. Therefore, total cost for compensation of standing crops is estimated as BDT 10.8 million.

Table 11.24: Estimated amount of compensation for standing crops

Types	Quantity in decimal.	Rate in BDT	Total estimated cost (in million BDT)
Compensation for crops production @ BDT 750/decimal/season including 100% premium for tower footing area and RoW area	7,183	1500	10.8

Source: Field survey, CEGIS, 2018

11.31 Compensation for Trees

The cost of affected trees due to the Project is estimated in Table 11.25. The total estimated amounts for compensation on trees is BDT 18.6 million

Table 11.25: Estimated cost of affected trees in the project area

Tree type	Number	Rate (in BDT/No.)	Estimated cost (in million BDT)
Fruit trees	448	6000	2.7
Timber trees	1368	11300	15.5
Medicinal trees	30	9600	0.3
Bamboo	245	350	0.1
Banana	305	400	0.1
Total			**18.6**

Source: Field survey, CEGIS, 2018

11.32 Resettlement and RehabilitationAssistance

Resettlement and rehabilitation (R&R)assistance is considered in addition to compensation to be given against losses of assets the affected persons as per the guideline of co-financier (AIIB). In this regard, total BDT 18.9million is estimated for different types of allowances (Table 11.26. The affected persons will be received the following assistances:

- Reconstruction grant for non shiftable structures;
- Transfer grant for shifting of structures;
- Assistance for loss of business/ wage income; and
- Special assistance to vulnerable households with support to livelihood and income restoration..

Reconstruction Grant

In the budget, the House Reconstruction Grant (HRG) for non-movable residential and commercial structures will be considered. The HRG will be 10% of non shiftableaffected structures of both titled and non-tilted owner(s).).

Shifting Grant

Shifting Grant is an additional assistance which is incorporated within budget. Shifting Grant for movable residential and commercial structures will be 5% of the replacement value of structure.

11.33 Income and Livelihood Restoration Grant

For business units, compensation or grant is considered in the budget for income loss. An amount of BDT 21.56 million is estimated as business income restoration grant for 14 days for each of two categories of shops (permanent and temporary) in the UGT RoW. Permanent shops are classified as (i) mega shops, and (ii) medium shops. Thus BDT4000, BDT2500, and BDT1500 calculated as per day income on average of mega, medium and temporary shops, respectively will be given as compensation to the affected persons in the UGT RoW.

11.33.1 Special assistance to vulnerable households

One time allowance equivalent to BDT10,000/ for vulnerability in addition to other entitlements for supporting livelihood and income restoration. This amount is not included in the budget but the provision of this special assistance is kept in the entitlement matrix of this RPF.

Table 11.26: Estimated cost for resettlement benefits of the affected entities

Types of Benefits	Amount (dec/sft/No.)	Rate in BDT	Estimated cost in million BDT
Reconstruction grant @10% of non shiftable structures			1.1
Shifting grant for shiftable structure @5% of the replacement value of structure			0.3
Income restoration grant for 14 days income loss (@BDT4000x14) of each permanent shops (mega) for underground transmission	96	56000	5.4

Types of Benefits	Amount (dec/sft/No.)	Rate in BDT	Estimated cost in million BDT
Income restoration grant for 14 days income loss (@BDT2500x14) of each permanent shops (medium) for underground transmission	162	35000	5.7
Income restoration grant for 14 days income loss (@BDT1500x14) of each temporary shops for underground transmission	307	21000	6.4
Cash grant for loss of agricultural income in the tower footing area equivalent to crop loss for three crop seasons	153	4500	0.7
Additional 10% of Resettlement Benefits			1.96
Total	-	-	21.56

Source: Field survey, CEGIS, 2018

12. Environmental and Social Management Plan

12.1 **Institutional Arrangements**

The Project Implementation Unit (PIU) that will be established within PGCB will lead the Project implementation. The PIU will be headed by the Project Director (PD). An Environment and Social Unit (ESU) has been established under the PIU and recruitment of qualified environmental and social staffs are underway. This ESU will assist the PIU on issues related to environmental and social management and oversee the Construction Supervision Consultant (CSC) and contractors and will compile quarterly mitigation and monitoring reports on ESMP compliance, to be sent to the Project Director and also shared with the AIIB, throughout the construction period. The ESU will also provide trainings to the PGCBfield personnel responsible for monitoring of environmental compliance during both construction and O&M phases of the project. The organogram of PIU is shown inFigure 12.1 The overall responsibility of environmental performance including ESMP implementation of the Project will rest with the PIU. Aside from their in-house environmental and social specialists, thePIU will engage construction supervision consultants (CSC) to supervise the contractors including on their execution of construction-related environmental and social management requirements and measures.The CSC will ensure adherence to the design parameters including quality requirements, as well as all ESMP measures related to construction.

The CSC will also supervise and monitor the contractors for effective ESMP implementation. The contractors in turn will also have EHS supervisors who will ensure ESMP implementation during construction activities and will be tasked to develop necessary detailed EHS plans (CEAP and OHS) as per this ESMP, and oversee their implementation.

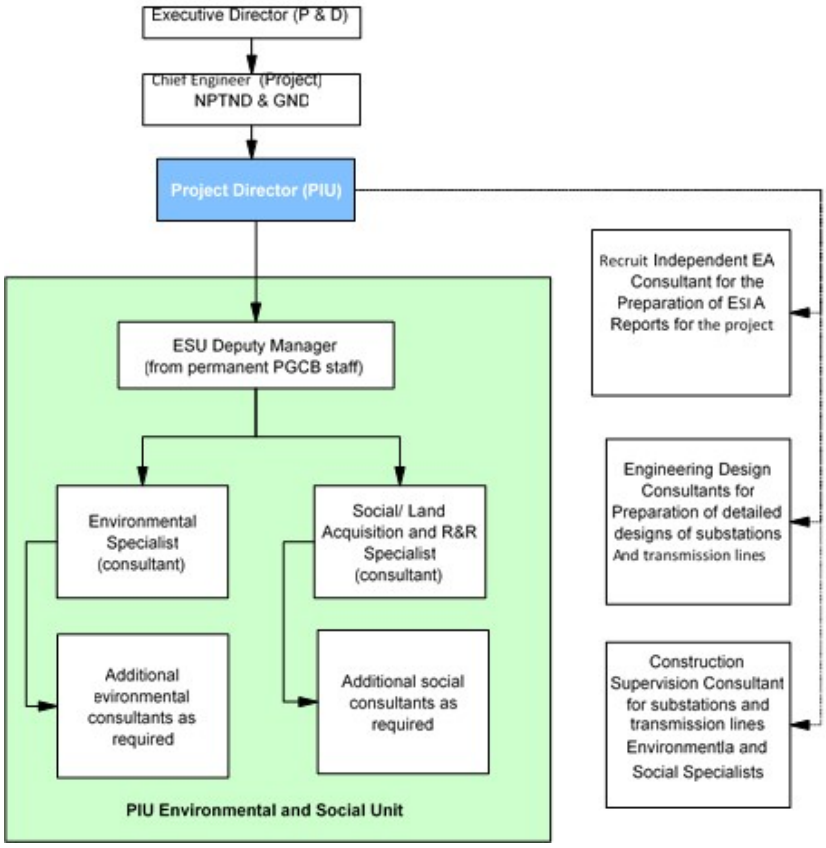


Figure12.1: Organogram for Environmental and Social Management of the project

The roles and responsibilities of PIU and its consultants are presented inTable.

Table 12.1: Roles and Responsibilities for ESMP Implementation

Organizations	Responsibilities
PIU	• Ensure that all project activities are well-managed and coordinated. • Recruitment of consultants for ESIA and engineering designs; and obtain approval of ESIA from the DoE • Procurement of works and goods. • Payment of compensation to the project affecters • Recruitment and supervision of Construction Supervision Consultants (CSC)
ESU within PIU	• Responsible for screening and determining scope of EA work required for subprojects and studies, assisting PD with developing ToRs and hiring of consultants to carry out any required environmental assessment work, reviewing consultant's deliverables related to environmental assessment, reviewing bid documents for inclusion of ESMP measures, supervising construction activities, producing periodic monitoring reports, • Ensuring inclusion of ESMP in bidding documents • Providing training on ESMP principles and requirements to PGCB and NLDC field staffs, and others as needed to ensure effective implementation of ESMP • Supervising CSC for the implementation of ESMP • Closely coordinate with other concerned agencies, local governments and communities to support implementation of ESMP • Preparation of progress reports on implementation of ESMP.

Organizations	Responsibilities
	• Ensure effective implementation of ESMP components not directly tasked to the contractor including components dealing with indirect, induced and cumulative effects, as well as operations and maintenance stage plans and measures. • Commissioning and oversight/review of consultant reports for ESIAs/ESMPs to be developed for the subcomponents of the Project
ESIA Consultants	• Carrying out an independent ESIA studies in compliance with the GoB and AIIB guidelines • Preparing ESMP for inclusion in the bid documents
CSC	• Supervise civil works, ensuring compliance with all design parameters including quality requirements • Supervising contractors for ESMP implementation • Prepare monthly reports and submit to PIU • CSC will have dedicated environmental, occupational health and safety and social staffs
Contractor	• Responsible for implementation of mitigation and monitoring measures proposed in the ESMP • Each contractor will recruit Environmental, Health, and Safety Manager, who will be responsible for implementing the contractors' environmental, health and safety responsibilities, and liaising with government agencies. S/he will have adequate number of staffs to support him/her for these tasks.

12.2 **Mitigation Compensation and Enhancement Plan**

The mitigation, compensation and enhancement plan are the major concerns for the proposed project. Following Table 12.2 represents the mitigation, compensation and enhancement plan of the proposed project.

Table 12.2: Environmental and Social Management Plan

IESC	Impact	Mitigation	Responsible Agency	Supervision Agency
Pre-Construction Phase				
Securing Land for stringing and erecting Transmission Towers	For the securing of land for erecting Transmission Towers some affected people will lose small proportion of their land permanently which will impact their livelihood also. Especially tower footing location of angel towers needs to be acquired. In some cases land will be temporarily affected during stringing activities	• Proper compensation should be ensured to the legal owner(s) according to the provisions of existing laws of Bangladesh. • Employment opportunity for the adversely affected people should be provided by engaging evacuees in the project construction activities. • Affected people should get proper compensation in terms of grants/allowances for the land acquisition and replacement of the structure. • Proper replacement should be ensured for the affected structure. • Crop compensation for existing crops must be ensured and notify the stakeholders before starting land acquisition procedure.	PGCB and DC office Chattogram	PGCB and DC office, Chattogram
Land Acquisition	For construction of Sub-station at New Moorings land will be acquired	• Land will be acquire through another project named *Enhancement and Strengthening of Power Network in Eastern (ESPNER of Bangladesh"* funded by World Bank.	PGCB and DC office Chattogram	PGCB and DC office Chattogram
Construction Phase				
Air Quality	Deterioration of air quality due to exhaust emission from vehicles,	(i) Water should be sprayed on road and material stockyards	Contractor (for implementation) and	PGCB or Third party monitoring and report to

IESC	Impact	Mitigation	Responsible Agency	Supervision Agency
	concrete mixture machine, dust emissions from the material stockyards and construction work at substation sites	(ii)Temporary fencing at construction sites should be done (iii) Construction material should be covered with thick polythene while transporting.	Third party monitoring	PGCB
Noise level	Generation of noise due to transportation of materials, and unloading of materials, stringing of transmission line, construction work and installation of machines at substation site	(i) Movement of material carrying vehicles should be restricted/ limited during the day time. (ii) Noise levels from vehicles, equipment and machinery should comply with national noise standards (iii) Use of PPE (ear muffs and plugs) to labor should be ensured; (iv) Vehicles and machinery should have proper mufflers and silencers	PGCB (for monitoring) and Contractor (for implementation)	PGCB or Third party monitoring and report to PGCB
Interference with road crossing and traffic congestion	Temporary impact on traffic on road	(i) Scaffoldings should be placed over the crossing points of roads while stringing conductors. (ii) Danger signs and public awareness are also required (iii) (i) Stringing wire work should be done in the early morning	Contractor (for implementation)	PGCB or Third party monitoring and report to PGCB
Wastes at project site	Disturbance to the surrounding land, water and settlements due to waste	(i) The surrounding areas of the project should be kept clean. (ii) Signboards and public awareness are also required	Contractor (for implementation)	PGCB or Third party monitoring and report to PGCB
Land Use	Permanently change of land use of basement of tower legs and substation area which converted to non-agricultural land.	• Fallow lands should be selected for the construction of towers and substations. • If avoiding is not possible, proper compensation should be introduced (for both standing crops and land).	PGCB, Contractor,	PGCB or Third party monitoring and report to PGCB along with Local administrator
Impact on Soil	Soil quality might be deteriorated	• The contractor should carefully dig the	Contractor	PGCB or Third party

IESC	Impact	Mitigation	Responsible Agency	Supervision Agency
	due to the soil profile of the dug hole will be altered and loosened.	hole for construction of towers and civil work of substations. • The excavated soils materials should be properly stacked for refilling the trench with soil by maintaining the sequence of the soil profile (i.e. Substratum–Subsoil– Topsoil). • The loosened topsoil's must be compacted well so that no erosion can take place. • The solid waste should be cleaned immediately after completion of the work		monitoring and report to PGCB
Loss of Crop	Around 27 tons crop might temporarily be damaged due to the construction of overhead towers in tower location, of which 12 tons rice and 15 tons non rice crops. Approximately 1,347 tons crops might be in danger during construction stage in ROW, of which 675 tonsrice and 672 tons non rice crops. This crop will be loss annually in ROWarea, if any accidental event takes place or unplanned construction will be done. Besides this, 65.89 metric tons crop will be lost permanently in the substation area annually.	• The mobilization and construction work of the project should be carried out carefully, so that standing crop would not damage. • The project work might delay for allowing the farmers to harvest their standing crop. • The work should not be continued through the ripened crop fields. • The notice of tower construction will be circulated to the affected farmers before the starting of cropping season.	PGCB, Contractor, Local Administration	PGCB, Third Party Monitoring and Local Administration
Tree cutting and Vegetation	• Total 2396 numbers of trees are found in overhead RoW.These trees may be impaced during construction of RoW. • Damages of all plants at the	• Keep vegetative area untouched during stockpiling; and • Compensation for cutting trees. Budget has been given in Chapter 11.	PGCB, Contractor, Local Administration	PGCB, Third Party Monitoring

IESC	Impact	Mitigation	Responsible Agency	Supervision Agency
	proposed tower sites; • Temporary loss of vegetation for pruning during wire stringing; • Additional damage of marginal vegetation due to stockpiling of construction material, labor and vehicle movements; and • Loss of vegetation as well as wildlife habitat at project sites.	• Avoid vegetation loss as much as possible during earthwork as well as wire stringing.		
Wildlife habitat	• Habitat loss and dislocation of wildlife from project and adjacent area ; and • Damage wildlife habitat during land development and civil works.	• Limit vegetation loss as much as possible; • Avoid construction work during breeding season and destruction of nest as wildlife habitats; • Use low sound emitting machines during construction; and • Avoid construction works at night to minimize disturbance to wildlife habitat.	Contractor	PGCB, Third Party Monitoring
Traffic Congestion	Currently Chattogram city is full of traffic due to construction work of flyover. Now the construction work for underground cable route through the city region will exacerbate already extreme traffic situation in Chattogram city.	• Construction works should be carried out after rainy season. • Project area must be well fenced but it must be well planned so that entry to any shops is not blocked. • Road excavation should be continued in planned way. • A bypass road may be introduced for avoiding traffic in busy spots. • Visible symbols, posters, sign etc are placed properly to aware the local passersby.	EPC contractor, PGCB and LGED	PGCB, Third Party Monitoring
Occupational Health and Safety	The contractors may recruit	• Child Labors will be strictly prohibited	EPC Contractor, PGCB	PGCB and Third Party Monitoring

IESC	Impact	Mitigation	Responsible Agency	Supervision Agency
	child and forced labour because of cheap wage rate. The recruitment of outsider labourer on the one hand may raise occupational conflict with local labourers, on the other hand, it may be an issue for health concern such as spreading of HIV/AIDS and contagious diseases by the outsider labourers.	• The project proponent must include a policy and also do practice in addressing the HIV/AIDS and contagious diseases issue. • Recruitment of local labour especially eligible labour from PAPs should be preferred • Create safe and free working place for women workers		
Community Safety and Security	Social safety and security would be impacted due to rapid movement of vehicles and other accessories during construction phase. Besides overhead transmission line goes over the structures.	• Social awareness for safety measure before starting construction work would be ensured at respective locality. • Build approach roads avoiding locality for ensuring social safety during construction phase of that project. • Existing route may be revised due to some structures are found in the RoW, if it is not possible proper safety must be ensured.	EPC contractor, PGCB	PGCB, Third Party Monitoring
Access Restriction	During excavation in the underground cable section, some restriction to access to shops by the roadside is envisaged	• Proper metal or wooden planks which are at least 1.5 meters wide, with hand railings should be placed across the excavated areas. Signages indicating risks in crossing the excavated stretches should be displayed along the stretch every 50 meters	Contractor	PGCB and Third Party Monitoring
Employment Opportunity	Wage based labor, lives and livelihood pattern would be	• Make a list of directly affected people who are interested to work during	EPC contractor and PGCB	PGCB, Third Party Monitoring

IESC	Impact	Mitigation	Responsible Agency	Supervision Agency
	impacted due to the construction of substation on the arable land in respective places where this project would be initiated.	construction phase. • Make clear lists of persons those are eligible to work guiding technical assistance after completing construction of that project. • New maintenance vacancies will be filled up by job seekers belonging to the respective areas. • Compensation may be provided for income loss of the affected people during construction period.		
Post Construction				
Vegetation	It require trimming or cutting of branches/trees for management of grid.	• Trim tree/branches of trees without damaging the main tree or core habitat; and • Avoid unnecessary trimming to vegetation.	Contractor	PGCB, Third Party Monitoring and preparing report according to DoE
Wildlife habitat	Electrocution of the flying mammals (Indian Flying Fox) with wire during their movement	Use insulated cables to avoid death of flying mammals.	Contractor	PGCB, Third Party Monitoring and preparing report according to DoE
	Tower of transmission lines will provide support to birds for resting and nesting.	• No enhancement is required.	PGCB and Contractor	

No Environmental management plan is needed for Fisheries resources because no impact is found for fisheries resources

12.3 **Environmental Management Responsibilities (Contractors) duringConstruction**

The Contractor and its employees shall firstly at all times try to avoid the negative impacts that may result from the project construction activities and secondly adhere to mitigation measures specified in the EMP and contracts to minimize harm and nuisances on the environment and local communities. Remedial actions which cannot be effectively carried out during construction stage should be carried out on completion of the woks and before issuance of the acceptance of completion of works.
The Contractor shall establish a robust environmental management system that addresses institutional, site-specific measures, monitoring, training and reporting requirements

12.4 **Environmental Protection Plan (Contractors)**

The Contractor must be provided with a copy of the EMP and the EMP must form part of tender documents. Before commencement of construction, contractors are required to submit a site-specific Environmental Protection Plan (EPP) for their work which will be reviewed and approved by Environmental and Social Compliance unit of PGCB. The EPP shall include the plans for the generic environmental mitigation measures (as well as specific mitigation measures for dredging, blasting, disposal, emergency response etc.), including, but not be limited to, the following items:

• A site plan showing work areas, fuel containment areas and refueling locations, lay down areas, parking areas, equipment maintenance area, material storage area and camp area.

• A detailed drainage handling plan, location of all water exit points and water quality monitoring locations;

• Waste management plan;

• Dust control plan;

• Noise control plan, and

• Spill response plan including location and contents of spill response materials storage and designated personnel to maintain spill response materials.

A summary matrix Table 12.3 for monitoring the activity of contractors that is to be submitted to PGCB.

Table 12.3 Summary Matrix for Monitoring the Activity of Contractors

Indicators	Issues	Compliance Monitoring Agency	Frequency	Complied Status		Remarks
				Complied	Not Complied	
Site Establishment	Alayout plan for construction activities needs to be developed and approved by the Environmental and Social Compliance unit	PGCB or Consultant	Before commencement of the site activities and first quarter or commencement			
Labor Employment	• The employment of labors should give priority to local labors. • The contractors should publicize appropriate work positions to the villages and towns along project areas • The workers and the staff members should have legal contracts for employment • The contractors should provide the workers with the educational training of environmental protection and occupational health and safety.	PGCB or Consultant	Quarterly in a year			
Health and Safety	• The contractors should ensure the projects conforming to all the national and local safety regulations as well as the other measures about damage avoidance. • Before the construction, the contractors should provide safety training for the workers. • Sufficient daylight and night illumination should be provided; • Adequate fencing needs to be provided around the site. This needs to be checked and maintained during the construction phase;	PGCB or Consultant	Every Month			

Indicators	Issues	Compliance Monitoring Agency	Frequency	Complied Status		Remarks
				Complied	Not Complied	
	• No other people is allowed to enter camp site without approval by management staff of the contractor; • The camping site should be provided and equipped with fire-protection equipment and fire extinguisher; • The contractors should provide the workers with enough personal safety protecting devices, e.g. protective glasses, gloves, protective mask, dust cover, safety helmet, ear protectors, steel helmet and so on, and ensure them to be used on the construction site. • The safety rules, the emergency pre-plan and the emergency contact information should be indicated on the bulletin board at the construction site.					
Waste Management	• During the construction phase the Contractor must make provision for the appropriate removal of waste from the site to a permitted waste disposal facility. The accumulation of construction waste materials must be avoided as far as possible. • All domestic waste generated by the contractor's activities at the contractor's camp must be stored in either refuse bins (i.e. steel or plastic 210L drums) or in a waste skip. The Contractor must ensure that these containers are emptied on a weekly basis, or as and when required. • All litter shall immediately be deposited into refuse bins or the waste skip. No litter must be left in the work areas or contractor's camp.					

Indicators	Issues	Compliance Monitoring Agency	Frequency	Complied Status		Remarks
				Complied	Not Complied	
	• Construction waste must be stockpiled in the contractor's camp and the Contractor must dispose of this waste properly. Contaminated construction waste must be dealt with separately.					
Waste Water Management	• Domestic sewage must be properly treated through, e.g. septic tank, before discharge. • The distribution of stormwater runoff as evenly as possible from the site;	PGCB or Consultant	Every Month			
Noise Control	• Limit construction times to the day times; • No noisy activities during weekend near local communities; • Should blasting be required during the construction phase, the necessary permits must be obtained from the local authority and any other relevant authority	PGCB or Consultant	Every Month			
Community Engagement and Complain Register	• During the construction period, the contractors should remain open communication with the local governments and the people of the relevant community. • Before the construction, the contractors should publicize the project information to the influenced party (e.g. local departments, enterprises and residents) in the form of community meeting. • All the construction sites should have striking signs about the project information, including but not limited to: • brief project description;	PGCB or Consultant	Every Month			

Indicators	Issues	Compliance Monitoring Agency	Frequency	Complied Status		Remarks
				Complied	Not Complied	
	• construction plan; • major construction activities; • principal environmental problems and mitigation measures; • names and telephones etc. of the project manager, the supervision engineer and the environmental protection personnel.					

12.5 **Traffic Management**

Before undertaking Works, the Utility Operator and/or Contractor must:

- Carry out a site assessment.
- Record the existing condition of all surfaces and above-ground Utility Structures in the immediate vicinity of the Work Site.
- Take photos to record the pre-existing condition of the Work Site, particularly any existing damage.

All traffic signal ducts, cables, chambers and poles affected by the Works must be reinstated by the Utility Operator and/or Contractor as soon as practicable.

If damage is caused to any Road, property or utility assets:

i) The Utility Operator and/or Contractor must notify the Corridor Manager and the respective Utility Operator and/or Contractor of any damage caused to its assets or property as a direct result of the Work it is undertaking.

ii) if it is not clear who or what was responsible for the damage, all relevant parties involved with the particular Works that have resulted in the damage must cooperate with the owner of the damaged assets in identifying the Party responsible for the damage;

Damage may include, but is not limited to, subsidence or settlement of Trenches or Road infrastructure, Road surface deterioration such as erosion of poor surface material, the appearance of the joint crack through the joint sealing or pot holing of the adjoining surface at the edge of the Work. Contractors must take appropriate steps to keep excavations free of water, to minimize risks associated with rainfall and subsoil drainage. Contractor also has to comply with the rules in the relevant District Plan or any specific resource consent related to the affected trees.

Before any excavation or saw cutting Work near traffic lights the Utility Operator and/or Contractor must liaise with the Corridor Manager to verify the location of cables and detector loops.

The construction site shall at all times be clearly defined and barricaded where appropriate, including any area of the Corridor used for storage or that does not have a proper temporary surface for public use.

The Utility Operator and/or Contractor must also ensure:

- The size of the Work and the Road portion of the site is kept as small as is reasonably possible.
- The site is kept tidy at all times.
- Safe provision is made for all Transport Corridor users including traffic, trains, pedestrians and cyclists.
- Access to properties adjacent to the site is avoided or minimized to the extent reasonably practicable.
- Storm water and siltation control is managed.
- At completion, the area must be tidied and left in a similar or better condition to that which existed before the Works commenced.

12.5.1 Traffic Management Plan:

1. The Utility Operator an/ or Contractor must implement the approved TMP, agreed as part of the CAR process, throughout the duration of the Works.

2. If a Work Site audit shows that the Traffic Management Plan does not comply with the above or any other condition, the Utility Operator and/or Contractor must remedy the non-compliance immediately, or cease working until authorized to recommence, except for that Work required to ensure the safety of the Work Site.

3. The Utility Operator and/or Contractor must follow all instructions given by an officer of the NZ Police in respect of traffic management, except that any Work Site ordered closed must be made safe before it is vacated.

4. Work shall be carried out outside peak traffic flows (except for Emergency Works), unless otherwise agreed.

The Utility Operator and/or Contractor must display signs for Major Works or Project Works, unless otherwise agreed with the Corridor Manager, as follows:

1. Placed at each end of the Work Site.
2. Clearly visible to pedestrians and other Traffic.
3. Include the name of the Utility Operator and Contractor, the nature of the Works, the likely duration and contact details.

The signs must, where practicable:

- Be at right angles to the Road centerline.
- Not obstruct access to private property.
- Not obstruct visibility at pedestrian crossings or intersections or advertising signs without the permission of the owner.
- Not be on a pole or structure without first obtaining the agreement of the owner.
- Not obstruct the visibility of road users, particularly at or near intersections or entrances.

The Utility Operator and/or Contractor must remove signs immediately the Work has been finished and the site cleared.

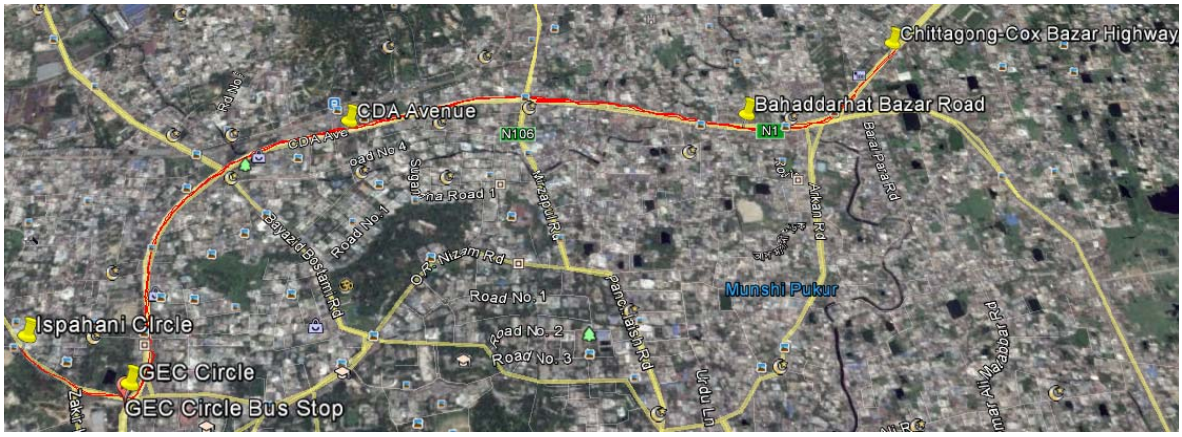


Figure: 12.1 Trenching route from Ispahani circle to Cox's Bazar Chottogram Highway

12.6 **Monitoring plan**

The environmental monitoring plan will help in detecting changes taking place during as well as after establishing the transmission lines so that necessary steps can be taken to rectify defects or deficiencies, if any. The monitoring plan focuses on implementation of the mitigation/ enhancement measures during the pre-construction, construction and post-construction/operation stages. The project implementation will be carried out under the overall supervision of the Project Director. For detailed supervision and monitoring, an external agency having experience in conducting environmental monitoring studies should be engaged.

12.7 **Monitoring Plan for Physical Environment and Water Resources**

IESC/ Indicator	Method	Location	Frequency	Responsible Agency	Cost (BDT)
Pre- Construction					
No monitoring plan is required.					
Construction					
Noise level		RoW and beyond	Once during construction period	PGCB and Contractors	1.00
Dust		RoW and beyond	Once during construction	PGCB and Contractors	1.00
Post- Construction					
No monitoring plan is required.					

12.8 **Monitoring plan for Land Agriculture Resources**

Table 12.3: Monitoring plan for Land Agricultural Resources

IECs/Indicator	Methods	Locations	Frequency	Monitoring Agency	Cost (BDT)
Pre- construction phase					
There is no Impact in this phase on land and agricultural resources.					
Construction phase					
Land Use	• Direct observation • Consultation with farmers and local DAE.	In all tower locations and RoW.	1. Every month during construction.	Project Director, PGCB,EPC Contractor (s)	1.0
Impact on Soil	• Soil sample collection through field visit • Laboratory analysis of soil samples for quality assessment.	In all tower locations and RoW	2. Twice (once before construction and one after construction).	Project Director, PGCB,EPC Contractor (s)	5.0

IECs/Indicator	Methods	Locations	Frequency	Monitoring Agency	Cost (BDT)
Loss of Crop	• Direct observation • Consultation with farmers and local DAE.	In all tower locations and RoW.	3. Monthly.	Project Director, PGCB,EPC Contractor (s).	1.0

12.9 **Monitoring Plan for Ecological Resources**

Table 12.4: Monitoring plan for Ecological Resources

IESC/ Indicator	Method	Location	Frequency	Responsible Agency	Cost (BDT)
Pre- Construction					
No monitoring plan is required.					
Construction					
Vegetation/species diversity	Quadrate Sampling	RoW and beyond	Once during construction period	PGCB and Contractors	1.00
Wildlife and their habitat	Habitat hectare	RoW and beyond	Once during construction	PGCB and Contractors	1.00
Post- Construction					
Vegetation/species diversity	Quadrate Sampling	RoW and beyond	Half-yearly observation for a 5-year monitoring plan	PGCB and DoE	5.00
Wildlife diversity	Habitat hectare	RoW and beyond	Half-yearly observation for a 5-year monitoring plan	PGCB and DoE	5.00

12.10 Monitoring Plan for Socio-Economic Resources

Table 12.5: Monitoring Plan Socio-economic Resources

IESCs/Indicator	Methods	Locations	Frequency	Monitoring Agency	Cost (BDT Lac)
Pre- construction Phase					
Land Acquisition	Land Acquisition should be completed through consultation with respective stakeholders and land owners	Site of substation and its total surroundings.	Once before construction.	EPC contractors and PGCB	*RPF Cost
Construction Phase					
Employment Opportunity	• Direct observation • Consultation with PGCB officials and contractor • Consultation with local people	In all tower locations and substation site	Bi-monthly during construction	Environmental and Social independent monitor, Project Director, PGCB and Contractor	1.0
Community safety and security	• Consultation with PGCB officials and contractor	In all tower locations and substation site	Bi-monthly during construction.	Environmental and Social independent monitor, Project	4.0

IESCs/Indicator	Methods	Locations	Frequency	Monitoring Agency	Cost (BDT Lac)
	• Consultation with labors			Director, PGCB and Contractor	
Traffic Congestion	• Consultation with PGCB officials and contractor	Substation location	Bi-monthly during construction.	Environmental and Social independent monitor, Project Director, PGCB and Contractor	3.0
Post- construction Phase					
No monitoring is required in this phase.					
Total					**8.0**

12.11 Budget for the Environmental Management Plan (EMP)

For implementing the Environmental Management Plan (EMP), about BDT 194.56 lakh will be required. The major cost will be required for EMP cost consisting of BDT 95 lakh and remaining BDT 78 lakh for monitoring and 21.56 lakh for R&R cost. The budget breakdown for the EMP is given in Table 12.6.

Table 12.6: Budget for the Environmental Management Plan

Item	Quantity	Rate/Ref.	Total Taka (lakh)
Mitigation Plan and contingency	4 years	Table 12.2(estimated)	35
Enhancement plan	4 years	Lump sum	20
Training of Professionals and Worker about accidental cases and safety measures	4 years	Lump sum	40
Sub total			**95**
Monitoring Plan for 4 years	**From revenue budget**		
Consultant (for monitoring)	48 person – month	Tk.100,000 per month	48
Transport (for monitoring team)	200 days	Tk.10,000 per day	20
Reporting and others (Yearly DoE renewal cost)		Lump sum	10
Sub Total			**78**
R&R cost from Chapter 11 (in million BDT)			**179.87**
Total Cost (in million BDT)			**197.17**

Source: ESIA Study, CEGIS

13. Grievance Redress Mechanism

13.1 Introduction

Grievance (in the context of a development Project) is an issue, concern, problem, or claim (perceived or actual) that an individual or community group wants to be addressed and resolved by the Project Authority. The grievance mechanism is a locally based, project-specific extra-legal way to deal with and resolve complaints and grievances faster and thus enhance project performance standards in terms of social and resettlement management.
PGCB will establish a grievance redress mechanism (GRM) as a means to ensure social accountability and to answer to queries and address complaints and grievances about any irregularities in application of the guidelines adopted in this ESIA for assessment and mitigation of social and environmental impacts. Based on consensus, the procedure will help to resolve issues/conflicts amicably and quickly, saving the aggrieved persons from having to resort to expensive, time-consuming legal actions. The procedure will however not pre-empt a person's right to go to the courts of law.

13.2 Objectives of Grievance Redress Mechanism

The fundamental objectives of the Grievance Redress Mechanism (GRM), implemented through the Grievance Redress Committees (GRC) serving as a para-legal body, are to resolve any resettlement-related grievances locally in consultation with the aggrieved party to facilitate smooth implementation of the social and environmental action plans. Another important objective is to democratize the development process at the local level and to establish accountability to the affected people.

13.3 Guideline to Redress Grievances

The Project Proponent would establish a procedure to deal with and resolve any queries as well as address complaints and grievances about any irregularities. In this regard, a policy and/or guideline will be prepared and adopted for assessing and mitigating potential social and environmental complaints/impacts through GRM. The GRM will deal with complaints and grievances related to both social/resettlement and environmental issues of the Project. GRC will be formed to receive and resolve complaints as well as grievances from aggrieved persons from the local stakeholders including the Project-affected persons. Based on consensus, the procedure will help resolving issues/conflicts amicably and quickly, saving the aggrieved persons from having to resort to expensive, time-consuming legal actions. The procedure will, however, not prevent a person's right to go to the courts of law. The GRCs will be established through a gazette notification from the Ministry of Power, Energy and Mineral Resources (MPEMR); therefore, the GRC will be a legally constituted body.

13.4 Composition of GRC

The Grievance Redress Committee (GRC) will be established locally at Project sites and centrally at the Project level to receive as well as settle grievances from the affected persons and other local stakeholders. The two-tier GRM will be-composed of local GRCs at the union/municipal level (LGRC), the first tier, and Project GRC at the central level (PGRC), the

second-tier. Most of the grievances will be resolved at the local-level GRC, but those cases that cannot be resolved at the local level will be forwarded to PGRC. The LGRC will be constituted with representation of the local UP Chairman and affected people ensuring women's representation. The PGRC will be constituted with representation from the Project ManagementUnit (PMU), Implementing NGO/Agency (INGO/IA) and one independent person from the civil society having knowledge about land acquisition law of Bangladesh and involuntary resettlement.

Local Level GRC (LGRC)

The following GRC composition is proposed for the local level GRC (LGRC) with representations from Project Proponent, INGO/IA, local public representatives, representatives of affected people including women in the Project area to ensure a participatory process and to allow voices of the affected communities in the grievance procedures.

1. Executive Engineer,PGCB :Convener
2. Representative of INGO/IA(non-voting) : Member-Secretary
3. Chairman of Union Parishad (UP) concerned : Member
4. Female Member of ward of the UP concerned : Member
5. Retired teacher from the union concerned : Member
6. Representative of PAPs : Member

One (1) representative of PAPs (based on the recommendation of INGO/IA and approved by the Convener) will be a member of the LGRC. The Member-Secretary of LGRC will be available and accessible to APs to address concerns and grievances. Unresolved cases will be forwarded to the PGRC. The LGRC is empowered to take a decision, which is bound upon the Project Proponent. But it requires the approval of the Project Director for implementation of the decisions.

Terms of Reference for Local GRC (LGRC)

The scopes of work and the Terms of Reference (ToR) for LGRC are:

i. The LGRC shall review, consider and resolve grievances related to social/resettlement and environmental mitigations during implementation of the Project.

ii. Any grievances presented to the LGRC, should ideally be resolved on the first day of hearing or within a period of four weeks except complicated issues requiring additional investigations. Grievances of indirectly affected persons and/or persons affected during project implementation due to social or environmental problems will also be reviewed by LGRC.

iii. The LGRC will not engage in any review of the legal standing of an "awardee" other than in the distribution of shares of acquired property among the legal owners and associated compensation or entitlement issues.

iv. LGRC decisions should ideally be arrived at through consensus, failing which resolution will be based on majority vote. Any decision made by the LGRC must be within the purview of RP policy framework and entitlements.

v. The LGRC will not deal with any matters pending in the court of law.

vi. A minimum three (3) members (in addition to the Member Secretary) shall form the quorum for the meeting of the LGRC to proceed.

The INGO/IA will assist the APs in lodging their resettlement complaints in a proper format acceptable to the LGRC after they get ID Cards from the Project Proponent (EA) or are informed about their entitlements and losses. LGRC meetings will be held in the convener's office in the Project area or other location(s) as agreed by the aggrieved persons. If needed, LGRC members may undertake field visits to verify and review the issues at dispute, including titles/shares, left-out cases during Joint Verification Survey (JVS) or other relevant matters.

Other than disputes relating to ownership right under the court of law, LGRC will review grievances involving all resettlement benefits, relocation and other assistance. However, the major grievances that might require mitigations include:

- APs not enlisted;
- Losses not identified correctly;
- Compensation/assistance not as per entitlement matrix;
- Dispute about ownership;
- Delay in disbursement of compensation/assistance;
- Improper distribution of compensation/assistance in case of joint ownership;
- Incorrect name in the award book of DC.

Project-level GRC (PGRC)

The Project-level GRC will review all unresolved cases involving social and environmental issues. The Project Director heads the PGRC. The composition of the PGRC will be as follows:

- Project Director, PMU, PGCB : Chairperson
- Team Leader of INGO/IA : Member Secretary
- Representative of Civil Society : Member

The Member-Secretary in the PGRCwill provide necessary knowledge and information regarding relevant standard policies and international protocols. He/she will also set examples of resolving such grievances from other development projects in Bangladesh. The PGRC should establish fairness and transparency in the resolution of grievances by project-affected persons. In case of technical or environmental issues as well as any legal matters, the Team Leader of the INGO/IA will advise the PGRC. In specific cases, environmental and social development specialists of Environment and Social Development Unit (ESDU) or external legal advisors may be consulted, if required.

ToR for Project Level GRC (PGRC)

The scope of work and the Terms of Reference (ToR) for PGRC are:

(i) Review, consider and settle unresolved grievances forwarded by LGRCs related to social/resettlement and environmental issues.

(ii) Any grievances presented to the PGRC should ideally be resolved within 5 (five) weeks from the date of receiving the complaints from LGRC.

(iii) In case of complicated cases, the PGRC Members can request additional information or carry out field level verifications.

(iv) Resolutions should be based on consensus among Members, where allthe decisions may be taken on majority vote.

(v) Any decision made by the PGRC must be within the purview of RP policy and entitlements.

(vi) The PGRC will not deal with any matters pending in the court of law.

(vii) All three (3) Members are required to form the quorum for the meeting of the PGRC.

13.5 Processes for Filing GRC Cases and Role of GRC

The procedural steps of resolving grievances and the grievance redress processes are presented in Figure 13.1. Figure 13.2explains the GRM in detail in a flow chart. GRC procedures and operational rules will be publicized widely through community meetings and pamphlets in the local Bangla language so that PAPs are aware of their rights and obligations, and procedure of grievance redress. All local GRC documents will be maintained by INGO for review and verification by CSC, Co-financier and any external reviewers. The PGCB Field Office(s) will act as the Secretariat to the local GRCs. As a result, the records will be up-to-date and easily accessible on-site.

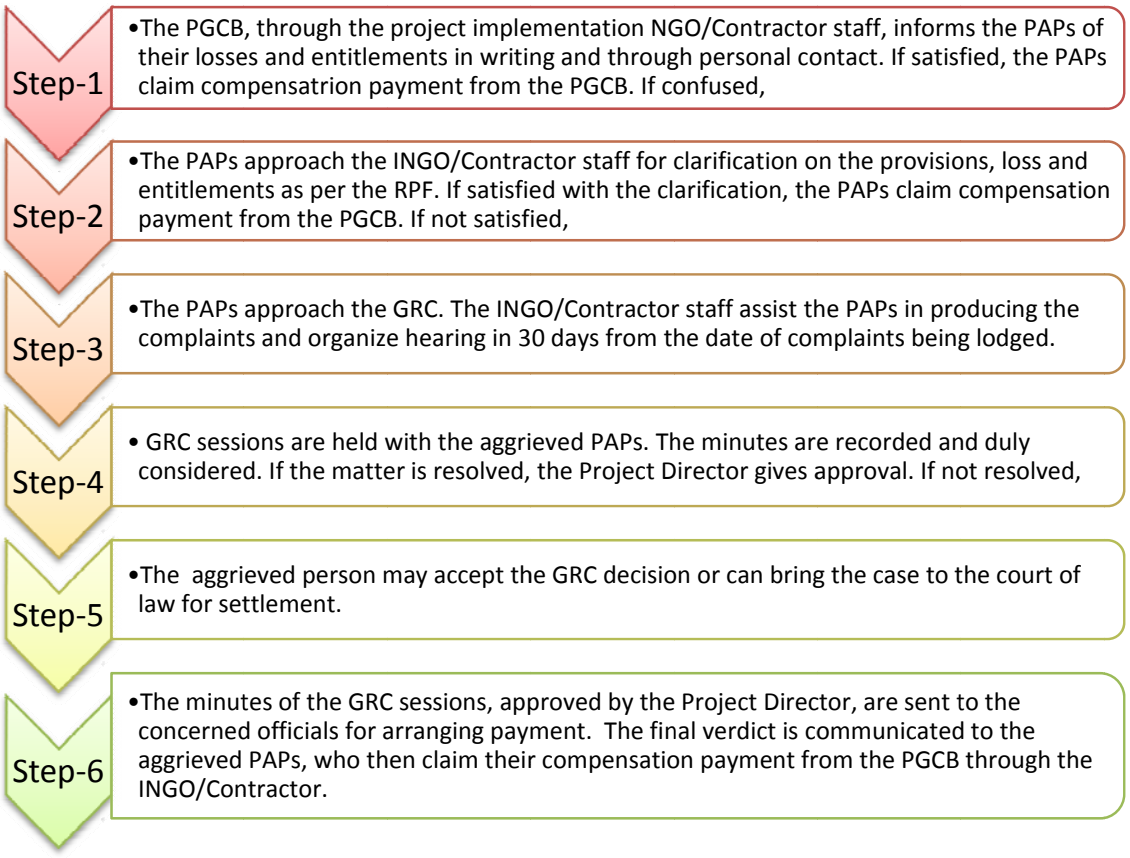


Figure 13.1 Grievances Redress Processes

14. Conclusion and Recommendation

14.1 **Conclusions**

PGCB is trying to development the power transmission line from different parts of Chattogram division, which would contribute to the national development. People all along the route of the transmission line expressed keen interest in the project even after recognizing the fact that they will not get electricity directly from the transmission line. Local people along the transmission line alignments will be indirectly benefited as the project will also generate some employment opportunities for them during the pre-construction and construction phases.

High-resolution Remotely Sensed (RS) images have been used in selecting the route of the transmissions line avoiding settlements and ecologically sensitive areas as much as possible. This has been reconfirmed by the ESIA team members who walked along the entire length of the alignment. Observations of the team members suggest that the route finally selected passes mostly through agricultural crop fields and not through settlement or ecologically sensitive areas. Some PCMs have been conducted along the RoW and substation area; people have shown very much interest on the development work.

Some minor negative impacts of the project will be felt during the pre-construction and construction phases which may involve removal of vegetation and cutting of trees for carrying construction materials to the sites, erection of poles and stringing of the transmission line conductors. These problems would be overcome by paying compensation to the owners, planting trees through the project EMP budget and bringing back these lands to their original form before handing them over to the owners after the construction. Crop production lost due to these activities during the pre-construction and construction phases will have to be compensated as well.

The project is not likely to have any significant negative impact; therefore, no major mitigation is required. The minor impact of noise and increase in traffic are within the existing levels those are experienced by the local people. The poles will be erected and the lines will be installed under expert supervision. The contractor will be under specific orders to provide personnel protective equipment to the workers engaged for the job.

The monitoring plan, if properly implemented during the pre-construction, construction and post-construction operation phases, will ensure taking corrective measures. The proposed project will have no residual adverse impact on the environment or the eco-system.

The PGCB is required to take environmental clearance from the DoE for implementing the transmission line and other ancillary works. The ESIA report has been prepared with this end in mind.

14.2 **Recommendations**

The environmental management plan should be integrated into the project design to ensure implementation of the mitigation and other contemplated enhancement measures. For reducing the spread of dust/SPM during the construction period, some protective measures

may be taken such as spraying water on roads, carrying materials at night, and temporary fencing of the construction sites.

Adequate precautionary measures such as nets should be placed over the crossing points of roads while stringing wires. Danger signs and public awareness are also required.

Sanitary waste disposal of the construction wastes at the tower and substation sites should be ensured during the construction period. Hygienic conditions should be ensured at the waste disposal sites.

During the construction period, the contractor should carefully dig the holes for erecting towers. The excavated soils should be properly stacked and the holes should be refilled with the stacked soils by maintaining the sequence of the profile (i.e. sub stratum – sub soil – topsoil). The loosened topsoil on the surface must be compacted well so that no erosion can take place. Vegetative cover either with the crops or grass must be restored in the affected part of the tower.

The mobilization and construction work of the project should be carried out carefully so that standing crops are not damaged unnecessarily. The project work may be delayed for allowing the farmers to harvest their crops. The work should not be continued through ripened crop fields.

Proper compensation should be paid to the actual landowners based on the present market values for tower footing location as well. As tower sites might be acquired in the future, it is recommended that the Electricity Act and Telegraph Act to be amended by the Government of Bangladesh for power projects.

After construction proper measures should be taken to dismantle labor sheds, leveling the fields to the original condition and clearing the fields. Common properties such as playgrounds, ponds and open spaces should not be disturbed.

The proposed project will have no residual adverse impact on the environment or the ecosystem. Finally, based on this impact assessment examination, it is observed that the proposed project can be implemented safely and in an environment friendly manner. Therefore, it is recommended that the project may be cleared to proceed with the works for sake of national interest.

Appendix –I: Site Clearance Certificate

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, Paribesh Bhaban
E-16, Agargaon, Sher-e-Bangla Nagar, Dhaka-1207
www.doe.gov.bd

Memo No: 22.02.0000.018.72.29.18. 110 Date: 04/03/2018

Subject: Site Clearance for the Expansion and Strengthening of power network project under Chittagong area.

Ref: Your Application dated 01/06/2017 & 24.01.2018.

With reference to the above mentioned subject, the Department of Environment (DOE) hereby accords the Site Clearance to the Expansion and Strengthening of power network project under Chittagong area subject to fulfilling the following terms and conditions.

1. This clearance shall only be applicable for the construction of transmission line under the Expansion and Strengthening of power network project under Chittagong area.
2. Proper and adequate facilities for construction and re-construction of transmission line must be ensured.
3. Drainage should be made in such a way that any solid waste cannot be discharged in the drain and drainage level should be such that it will properly drain water during extreme climatic condition.
4. In order to control noise pollution, vehicles & equipment shall be maintained regularly; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.
5. Rehabilitation of human settlement or compensation for any sort of activity which will incur damage or loss of public or private property shall be addressed as per Government of Bangladesh rules and regulations (if necessary).
6. All the required mitigation measures suggested in the Environmental Management Plan in the IEE report are to be strictly implemented and kept operative/functioning on a continuous basis.
7. Construction material should be properly disposed off after the construction work is over.
8. Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be demolished or destructed.
9. Environmental Monitoring Reports shall be made available simultaneously to Head quarters and respective Divisional office of the Department of Environment on a quarterly basis during the whole period of the project.
10. After completion of the infrastructure development, project proponent shall apply for Environmental Clearance to the Chittagong Regional Office, Chittagong.
11. This clearance is valid for one year from the date of issuance and project proponent shall apply for renewal to the Chittagong Regional Office, Chittagong at least 30 days ahead of expiry.

This Clearance Certificate has been issued with the approval of the appropriate authority.

04.03.2018

(Syed Nazmul Ahsan)
Director (Environmental Clearance)
Phone # 8181673

Chief Engineer (Project Monitoring)
Expansion and Strengthening of power network project under Chittagong area
Power Grid Company of Bangladesh Ltd.
7th Floor, NLDC Complex, Aftabnagar, Rampura, Dhaka-1212.

Copy Forwarded to :

1) Private Secretary to the Hon'ble Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
2) Director, Department of Environment, Chittagong Regional Office, Chittagong.
3) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

Appendix –II: A3 Layout Maps

Appendix –III: Participant List

List of participants of Consultations

Sl. No.	Name	Age	Occupation	Phone Number
1.	Md. Abdur Rashid	38	Business	01715816326
2.	Md. Haji Nurul Amin	70	Agriculture	01815021192
3.	Md. Jalal Miah	54	Day Labor	
4.	Md Yousuf	62	Retired	01931208629
5.	Md SadhonBabu	35	Business	01823943551
6.	Md. Jony	32	Day Labor	01843773622
7.	Md Abdul Malek	28	Driver	01813268092
8.	Md. Jahangir Alam	45	Business	01831530691
9.	Md. Shamsul Alam	48	Day Labor	01706475872
10.	Md. Abul Kalam	55	Day Labor	01795805420
11.	Md. Azad	38	Day Labor	01815476883
12.	Md. Alamgir Hossain	38	SAE	01716496307
13.	S. M. Asaduzzaman	35	SAE	01837021614
14.	Md. Monjurul Haque	30	SAE	01837235211
15.	Md. Mujibur Rahman	48	UP Chairman	01817745954
16.	Md. Robiul Hossain Foysal	22	Student	01854377773
17.	Md. HumayunKarbir	38	Service	01817929795
18.	Md. Abdul Jabbar	45	Service	01812813422
19.	Md. Shakil	19	Student	01828041109
20.	Md. Zahidul Islam	48	Day Labor	
21.	Md. Nur Hossain	62	Unemployed	
22.	Md. Shah Alam	45	Farmer	01881640475
23.	Md. Bashir Ahmed	38	Farmer	
24.	Md. Sarwar Hossain	32	Business	01711050973
25.	Md. Saifuddin Khaled	42	Word Counselor	01817718321
26.	Md. Morshed Alam	45	Word Counselor	01819520007
27.	Md. Hossain Hiron	48	Ward Counselor	01670313131 01740-939428

Sl. No.	Name	Age	Occupation	Phone Number
28.	Ujjal Shaha	40	Executive Engineer	01674073791
29.	Nuruddin Mohammad Forhad Chowdhury	38	Executive Engineer	01777743223
30.	Md. HasnatKamrulQuysar	32	Assistant Engineer	01817773620
31.	Md. Mozammel Haque	29	Sub-Assistant Engineer	01817247339
32.	ASM Quyes Uddin	30	Sub-Assistant Engineer	01711798322
33.	Md. Abdul Halim	26	Sub-Assistant Engineer	01732956239
34.	Md. Alamgir Hossain	25	Sub-Assistant Engineer	01716496307
35.	Ariful Haque Sajib	28	Assistant Engineer	01711432920
36.	Md. Abdul Majid	52	Chairman	01817745954
37.	Abul Hashem	48	Chairman	01860389274
38.	Md. Arab Hossain	16	Student	
39.	Md. Shahjahan	54	Farmer	
40.	Md. Jakir Hossain	45	Businessman	01811204939
41.	Md. Joynal Abedin	48	Businessman	01845090932
42.	Md. Nasir Uddin	54	Service	
43.	Md. Shwapon	32	Business/Worker	01734636071
44.	Md. Saddam Hossain	20	Worker	01822009524
45.	Md. Abul Hossain	24	Worker	01966100234
46.	Md. Noor Mohammad	56	UP member	01818514634
47.	M A Quyum	35	Service	01816447530
48.	Mujibur Rahman	45	Chairman	01817745954
49.	Abu Bakar Siddique	42	Ex Up Member	01819386492
50.	Md. Arju Mia	24	Businessman	01856705751
51.	Md. Anwar Hossain	21	Worker	01815572140
52.	Md. Mosleh Uddin	24	Worker	
53.	Md. Mainuddin	25	Worker	

Sl. No.	Name	Age	Occupation	Phone Number
54.	Md. Kamal Hossain	34	Businessman	01846465947
55.	Md. Mahabubul Alam	32	Worker	
56.				

Participants List

Village/Mouza:
Union:
Upazilla:
District::
Date:

SL No	Name	Age	Occupation	Mobile No/Address	Signature
0	এম. এ. [illegible] শাহ	৪০	চেয়ারম্যান ২নং [illegible]	০১৮১৬-৪৪৭৫৬০ 01712608912	[signature]
0	[illegible] উদ্দিন [illegible]		[illegible]	০১৮-১৮৩২০৮৪৫	[signature]
θ	মো: সবুর		[illegible] ৩নং [illegible]	01828-582413	Sabuj
θ	[illegible]		[illegible]	০১৮৮০১৬৪৮৭০	[signature]
θ	মো: কামাল উদ্দিন	৪৪	১নং [illegible]	০১৮১৯৬৪৪৭৮৬	[signature]
θ	মো: ইসমাইল [illegible]	৫০	৮. [illegible]	0181551959২	[signature]
0	[illegible]	৫৯	0 ২	01818 514636	
θ	[illegible]	৫২	0 ৬	01861922980	[signature]
θ	Md. Aytul Hoque	35	3No WARD	01816-110006	[signature]
0	MD, YOUSOF	44	[illegible]	018198287	[signature]
1	বিপ্লব বৈদ্য	37	[illegible] ৭নং ওয়ার্ড	01815040306	[signature]
2	মো: আজিজুর	৫৫	[illegible]	01820041323	[signature]
3	[illegible]	৫৬	৪. ৩ [illegible]	01817734267	[signature]
4	হাসান	26	ব্যবসা	01829331933	[signature]
5	[illegible]	86	[illegible] ২নং [illegible]	01817267641	[signature]
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Participants List

Village/Mouza:
Union:
Upazilla:
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SL No	Name	Age	Occupation	Mobile No/Address	Signature
0	আসাদুজ্জামান খান আশু	34	স্বাস্থ্যসেবা ভিডিপি	01819360682 01711396456	[signature]
0	গোলাম [illegible]	৪০		01882212108	[signature]
θ	মোঃ নুরুল ইসলাম		ব্যবসা	01813690755	[signature]
0	মোঃ আমজাদ হোসেন [illegible]			01815822344	[signature]
θ	মোঃ জাফর			01676296269	[signature]
θ	লাকী আক্তার		U.P	01812747917	লাকী
0	রাফিয়া সুলতানা		ইউপি সদস্য	[illegible]	[signature]
θ	শাহ আজিজ	31	X.U.P	01820133655	[signature]
θ	মোহাম্মদ ফারুক			01879173012	Faruk
0	নুরুল ইসলাম			01819672792	[signature]
1	আবদুর রহিম		কৃষক	01813400199	Rahim
2	নুরুল আমিন [illegible]		শিক্ষক	01817727895	[signature]
3	মোস্তফা কামাল	40 34	ব্যবসা	01874478881	[signature]
4	মোঃ হান্নান [illegible]	28	ছাত্র	01816771662	[signature]
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Participants List

Village/Mouza:
Union:
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SL No	Name	Age	Occupation	Mobile No/Address	Signature
01.		৪৩	কৃষক	০১৪১৭৭৭৩৯৩৭	
02.		৪৫	ব্যবসা	০১৪১২৫২১১১০	
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Village/Mouza:
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SL No	Name	Age	Occupation	Mobile No/Address	Signature
01.	মোহাম্মদ হোসেন [illegible]	৬৬	[illegible]	[illegible]	[signature]
02.	মোঃ আবদুল [illegible]	৫১	ব্যবসায়	[illegible]	[signature]
03.	মোঃ [illegible] হোসেন [illegible]	৬০	"	[illegible]	[signature]
04.	মোহাম্মদ কায়ছার মল্লিক	৪৯	কৃষক	[illegible]	[signature]
05.	মোঃ মাহামুদুর রহমান	৩৬	"	01711-989327	[signature]
06.	মোঃ নুরুল মোস্তফা	48	"	01818-504204	[signature]
07.	মোঃ গোলজার হোসেন	66	"	01819-868082	[signature]
08.	[illegible]	38	"	01843401480	[signature]
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"বাংলাদেশ পাওয়ার গ্রীড কোম্পানি লিমিটেড (পিজিসিবি)" কর্তৃক সাব-ষ্টেশন স্থাপন ও সঞ্চালন লাইনের কারণে পরিবেশগত ও সামাজিক প্রভাব প্রশমনের উপায় ও ব্যবস্থাপনা নিরূপণ বিষয়ক

মতবিনিময় সভায় অংশগ্রহণকারীদের তালিকা

স্থান : Bohoddarhat

সময় : 11:40

তারিখঃ 16-11-2016

ক্রমিক নং	নাম	পদবী/ ঠিকানা	মোবাইল নম্বর	স্বাক্ষর
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৪	[illegible]		01816792923	[illegible]
৫	[illegible]	[illegible]	01819941434	[illegible]
৬	নুরুল আমিন	[illegible]	01819548545	[illegible]
৭	মোঃ [illegible]	[illegible]	01918234219	[illegible]
৮	মোঃ [illegible]	[illegible]	01817750577	[illegible]
৯	[illegible]	[illegible]	[illegible]	
১০	[illegible]	৪নং ওয়ার্ড [illegible]	01814266474	[illegible]
১১	[illegible]	[illegible]	01715443537	[illegible]
১২	মোঃ [illegible]	[illegible]	01815977794	[illegible] 16/11/16
১৩.	মোঃ [illegible]	[illegible]	01817201278	[illegible]
১৪	মোঃ [illegible]	[illegible]	01814493732	AbdNOOR
১৫	[illegible]	[illegible]		[illegible]
১৬	[illegible]	[illegible]		[illegible]
১৭	[illegible]	[illegible]		[illegible]
১৮	[illegible]	[illegible]		[illegible]

আয়োজনে:

CEGIS Center for Environmental and Geographic Information Services
House 6, Road 23/C, Gulshan-1, Dhaka-1212, Bangladesh. Tel: 8817648-52, Fax: 880-2-8823128

Participants List of Public Consultation
On
Expansion and Strengthening of Power Network Project under Chittagong Area.

Venue: .....

Date: ৬১.১০.১৮

SL No	Name	Age	Occupation	Address	Mobile No	Signature
01.						
02.					01815350626 01815350626	
03.						
04.						
05.						
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Participants List of Public Consultation

On

Expansion and Strengthening of Power Network Project under Chittagong Area.

Venue: ২নং ওয়ার্ড [illegible] শাকির হোসেন রোড

Date: ৩১.১০.১৫

SL No	Name	Age	Occupation	Address	Mobile No	Signature
01.	মোঃ আব্দুল্লাহ [illegible]	[illegible]	[illegible]		0184033605	[illegible]
02.	মোঃ [illegible]	৬৫	[illegible]		01868655478	[illegible]
03.	[illegible]	22	[illegible]		01851377382	[illegible]
04.	মোঃ [illegible]	৪২			0194073408	[illegible]
05.	মোঃ [illegible]	৪২			01831407711	[illegible]
06.	মোঃ কাসেম আলী	৫০			01 --	[illegible]
07.	[illegible]	৬৭			01844324976	[illegible]
08						
09.						
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Appendix IV: Inventory of Losses

List of Affected Permanent Shopsin the Underground Transmission Line

Sl.	Name of the Shop	Daily Income	Phone No	NID
1	Md. Kamal Hossain	250.00	01689738839	912928448481
2	Solamon Tea Stall	300.00	01823288514	1516124067794
3	Janata Pharmacy	2300.00	01923387126	3715431536
4	Momota Tyre House	2500.00	01831822788	
5	Imtiaj Telecom	20000.00	01816234949	6415362786
6	Anowar Tea Stall	400.00	01816006795	7514723115559
7	Nejam Store	7000.00	01824533854	1900319433
8	Modina Hardware	5000.00	01818050219	
9	Tutul Automobile	1400.00	01791150543	
10	Imran Hotel	6000.00	01822693961	
11	Takua Enter Prize	3500.00	01819103815	1459507669
12	Khayer Hotel	6000.00	01866905573	19757512135049300
13	Salah Vangari Store	3000.00	01817271687	
14	Jabal Hotel	5000.00	01866693308	4600753570
15	Amanot Shah Telecom	8000.00	01882587532	19921516188000025
16	Ishan Foods	20000.00	01815018509	1593526425939
17	Robi & Mintu Salon	400.00	01823456191	
18	Tahamid Fashion	6650.00	01822501000	199215920370000243
19	Alam Medico	1600.00	01816363238	1592037444436
20	Bismillah Hotel	10000.00	01830055516	8665420462
21	Farukh Mistri Auto Mobile	1000.00	01819949443	4614961573
22	Azad Hotel	850.00	01989789282	4164947089
23	Boton Kormokar	1500.00	01866356309	15182692422768
24	Shah Enterprise	12000.00	01819354073	1592037856302
25	SAWON & REZVI STORE	8000.00	01823946982	
26	Nurul Wood House	1400.00	01817255582	
27	Md. Farid	15000.00	01817703546	7300326472
28	Ma Store	8000.00	01711079006	4165388093
29	Arfan Workshop	1200.00	01829922137	1450277734
30	JAFOR MOTORS	10000.00	01834852430	7770147580

Sl.	Name of the Shop	Daily Income	Phone No	NID
31	Mizan Stor	5000.00	01711108411	5050218659
32	Babul Kanti	500.00	01818085404	28014768776
33	Salim Hotel	20000.00	01811102050	1007486135
34	Md. Naser	700.00	01866702145	8200224644
35	Arif Store	6000.00	01617208967	2800230944
36	Mayer Doa Auto Honda Garage	1000.00	01819930815	7764934324
37	Gausia Motors	5000.00	01838765814	
38	Monirul Sports and Library	5000.00	01857857336	3700232022
39	Makka Madina Diesel Service	2000.00	01855041392	
40	Momotaz Enterprise	20000.00	01819832602	1518638212802
41	Jashim Store	3000.00	01862023587	6865391020
42	Mariya Glass And Thai Fashion	10000.00	01830143253	1593526073258
43	SSN Automobiles	4000.00	01827044056	19673011495000055
44	Abdul Wahab Garage	1650.00	01818738527	5950480615
45	Rasel Store	6000.00	01839659997	5065413089
46	Shahnewaj Bappi	800.00	01616037305	7777574422
47	Akter Garej	350.00	01858548112	2564936530
48	Abu Taher Tailers	2500.00	01811212350	2800323285
49	Munireya Traders	15000.00	01817271687	8214955836
50	Jaman Shop & Stationary	8000.00	01819444202	4605896184
51	Shamsul Hotel	3500.00	01712908817	7764949678
52	Jahir Poltry Store	2500.00	01623527127	1900402817
53	Mirza Auto Center	1800.00	01823142905	19937518013000221
54	Sohag Alam Store	15000.00	01845242909	46115540475
55	Sama Store	3000.00	01828811631	1915438491
56	Jakir Pan Store	2500.00	01822536909	4600233946
57	Sawon Store	4500.00	01818166815	5965100471
58	Mahabub Store	3500.00	01829502197	
59	Komor Store	5000.00	01618140798	7764824384
60	Mesars Nahar Motors	6000.00	01818021338	2350227605
61	Ma Quality Tailors	4200.00	01822119711	7764798869

Sl.	Name of the Shop	Daily Income	Phone No	NID
62	Chowdhury Fresh Food	15000.00	01816283694	19921917470000145
63	Alamgir Store	7000.00	01855862363	1592037857753
64	Ma Babar Doya volcanizing shop	16000.00	01909030322	1917277709436
65	Kalam Auto Mobile	6000.00	01865957694	3012930382627
66	Robin Store	4500.00	01874196348	75107527815897
67	Confidence Store	60000.00	01814142829	1917413726120
68	Harun Store	5000.00	01814996138	5950227404
69	Jabed Store	2000.00	01791511612	8202235612
70	Khokon Store	3000.00	01824993223	1593526426498
71	New Jannat Bekari	15000.00	01815510211	
72	Madie Store	18000.00	01815350626	5076262525
73	Azizur Store	2500.00	01871074965	8693472808
74	Mesars Nahar Enterprise	15000.00	01855000096	4156249502
75	Abu Taher	4000.00	01858748672	
76	Rupon shil store	2200.00	01831790870	
77	Ismail Store	9000.00	01845862508	5961654141
78	N S Cycle	8000.00	01863350761	1592829494383
79	Hanif Store	3000.00	01811534821	5500321145
80	Askandar Fruits	8000.00	01811753932	1517488717095
81	Messrs. Ahsan Radiator Soldering Serveries	2500.00	01816416856	
82	Messrs Caslima Enterprise	3500.00	01815062712	
83	Mayer Dowa Hotel	12000.00	01729137902	
84	Ma Engineering Workshop	5000.00	01831033270	
85	Shamsu Furniture	1500.00	0182941570	
86	Khalilur Rhaman	3000.00	01738774993	7767452587
87	Azad store	12000.00	01623441904	7518013884898
88	Lake View	10000.00	01823559977	19921517892000034
89	Sheikh Abdul Gaffar	5000.00	01819373805	1513789161338
90	Mega Furniture	7000.00	01673690093	19911592039000596
91	Nahima store	10000.00	01813579070	09807518315000056
92	Habib Store	4000.00	01863344969	

Sl.	Name of the Shop	Daily Income	Phone No	NID
93	Shajalal Motors	3500.00	01812294844	19951517875000049
94	Muktijodha Tea Stall	1200.00	01647530312	
95	Ma Engineering	3000.00	01811817647	1593525326973
96	Nayeem Engineering Workshop	4000.00	01814310136	1511266171883
97	Mohammodia Hotel	15000.00	01917371655	
98	Tasfi Fruit Store	7000.00	01823164833	
99	Kohinor Tyre House	10000.00	01760906175	1594132010303
100	Jamal Store	4000.00	01832608920	1591905803961
101	Shakhawat Store	25000.00	01817796822	15153224529373
102	Poly Store	3000.00	01823231870	8663230178
103	Mazumder Store	3000.00	01843032640	4616951325
104	Harun Store	10000.00	01965653836	1594309792736
105	Digital Electric Services	3200.00	01822228112	9557756211
106	Abeda Trading	5000.00	01515596324	1591904532159
107	K B K Tailers And Fabrics	7000.00	01816823612	1910912289163
108	M X Trading	20000.00	01711025260	
109	Vai Vai auto Services	4000.00	01866778737	19929518737033683
110	Ad Computer & Photostat	2000.00	01815927296	1594121397011
111	Nur Departmental Store	10000.00	01813186150	4652611148
112	Mamoni Motors Workshop	3000.00	01829491344	1502232089
113	Lake View	8000.00	01815510805	1594309014804
114	Jubaer Honda Service	3000.00	01721500007	7329865252
115	Amir Store	1200.00	01823162158	1594308933603
116	Food Plaza Bakery&Restaurant	30000.00	01711750672	6426108111
117	New Express	2500.00	01849731638	1516158897298
118	M/A Ma Babar Ashirbad	4000.00	01823943551	1592036091294
119	Khawaja Store	8000.00	01814379560	1511828495458
120	Kashem Fruit Vander	6000.00	01782505863	
121	Shohel Enterprise	9998.00	01919350880	7518394562448
122	Shahin Parlour	4000.00	01628263862	1593526426980
123	Kalam Store	20000.00	01815122453	1594309014468

Sl.	Name of the Shop	Daily Income	Phone No	NID
124	Tusher Motors And Eng. Workshop	5000.00	01815641409	4175882234
125	M/S Roma Store	4000.00	01915839600	2363318003
126	M/S Azam Store	10000.00	01868655478	1594309792800
127	Hafej Monir Engineering	70000.00	01819610605	4600229043
128	Mostafiz Medical Hall	30000.00	01819662893	7326547531
129	Tasmin Store	1500.00	01878163980	1592037444260
130	M/S Rahman International	5000.00	01726150713	1218547979218
131	Khaja Thai Aluminum& Glass House	5000.00	01822319340	19831518666232244
132	Mum Vat Ghar	4000.00	01812062090	
133	Al Madina Traders	20000.00	01818460325	1513729129009
134	Modina Enterprise	5000.00	01818547337	1594308997484
135	Khaja Eng. Workshop	15000.00	01824572205	1915109423
136	Mintu Store	2500.00	01884802670	5064938557
137	M S Telicom	30000.00	01848480918	1594313854793
138	The Chittagong Hotel	10000.00	01819628770	9564965029
139	Ma Moni Gas Welding	3000.00	01812351681	1594116724203
140	Jakir Garage	1200.00	01832221713	4150324848
141	Ananda Polling Corner	5000.00	01815611439	1595708405299
142	Ma Auto Electric	15000.00	01822803041	
143	Foyej Enterprise	25000.00	01745624603	1595708406176
144	M/S Vai Vai Tailors	5000.00	01715674409	7520708502277
145	Kanchon CoolingCorner	8500.00	01827835561	19921518283000113
146	Nahar Motor Tailoring Workshop	7000.00	01920552323	1990159708000068
147	Tayabia Thai Aluminum	50000.00	01824645362	1592037447642
148	Allah'r Dan Hotel	10000.00	01857001661	8230832522
149	Rafique Store	14000.00	01819621609	1513789162457
150	Isma Hotel	8000.00	01782505863	8676313623
151	Car Fair	15000.00	01851642374	2842719599
152	Mukta Electric	3000.00	01759097314	
153	Dilep Medical Hall	4000.00	01814727828	2211639111221

Sl.	Name of the Shop	Daily Income	Phone No	NID
154	Al Haque Store	2500.00	01628485563	
155	Nurzahan Ring And Tyre House	25000.00	01664746610	09924628002000014
156	Ibrahim Store	5000.00	01819357069	1517450482936
157	M/S Shumi Medico	30000.00	01819860083	1517411440268
158	Nor Jahan Enterprise	15000.00	01819644947	1518628124245
159	Shumi optics	5000.00	01674222576	
160	Al Mojib Timber & Furniture	15000.00	01821711733	
161	GausiaEnterprise	20000.00	01851377382	19931517412000100
162	Madina Gold Fashion Jewelers	5000.00	01860864995	19821517425000013
163	Allah'r Dan Biryani House	3000.00	01902842399	
164	Mirshorai Hotel	12000.00	01840336056	
165	Ohi Fast Food & Biryani House	7000.00	01817762355	1521804546569
166	M/S Sajib Enterprise	10000.00	01811205018	1528609027128
167	M/A KabirEng. Workshop	7500.00	01856847809	4150220525
168	Didar Tea Stall	3000.00		1518666250627
169	BM Electronics And Stationery	7000.00	01831407711	
170	M/S Nitu Enterprise	5000.00	01824453676	5061669338
171	ZihanEnterprise	25000.00	01817713950	7513821548770
172	Kabir Store	6000.00	01830089311	1513789164000
173	Al Madina Super Shop	7000.00	01817700541	1513710079198
174	RRahman Enterprise	20000.00	01932550460	7312396083
175	Bismillah Enterprise	25000.00	01919350880	75183954562448
176	Anisa Workshop	13000.00	01821288718	1953526343383
177	M/S Taqwa Enterprise	4000.00	01819103815	
178	A K Traders	10000.00	01811674141	5500229413
179	Angelie Rose	7000.00	01979000253	19821595707358761
180	M/SThahar Shah Enterprise	40000.00	01779989039	1969595707044327
181	Jahangir Store	3000.00	01813689335	5500322036
182	Azim Store	10000.00	01633973725	

Sl.	Name of the Shop	Daily Income	Phone No	NID
183	Mamumn Vangari Dokan	20000.00	01811860172	1592827520992
184	Bismillah Sanitary	10000.00	01746187993	1593526926716
185	Gauchia Hoque Engineering	50000.00	01932979594	
186	New General Refrigeration&Air Condition	5000.00	01811859180	3015140773909
187	Rasel Store	4000.00	01830040892	
188	Azmir Binding House	1500.00	01912060143	1594314764309
189	Rabiul Store	15000.00	01715115789	9564965193
190	Amanat ShahAuto Electronics	5000.00	01815300974	9118872648
191	Joni Store	2000.00	01843773622	1594131399050
192	Jhal Bitan	10000.00	01712078756	1013058217
193	Al Amin Trading	25000.00	01817207122	1594313855373
194	Shimul Store	11000.00	01839086851	1594309789498
195	Lucky Pharmacy	3000.00	01960552857	1528208059856
196	Biswanath Store	40000.00	01827414044	
197	Sumon Store	12000.00	01790382711	
198	Nazrul Store	13000.00	01821393047	7779661284
199	Lake View	14000.00	01843008736	
200	Fair Price	25000.00	01671204718	
201	Mohammadi Auto Car Serving	12000.00	01831014440	2826103273

List of Affected Small TemporaryShopsin the Underground Transmission Line

Sl.	Name of the Shop / Owner	Daily Income	Phone No	NID
	Khayer Hotel	6000	01866905573	19757512135049342
	Banana's Store	5000	01880923385	1595707044932
	T Shirt Store	2498	01643425593	
	Rahim Halim	2998	01770406135	
	Rajib Store	2199	01829874875	5117387327486
	Solaiman Center	2000	01828065207	
	Banana Shop	1200	01840906156	15161523804566
	Kashem Store	3000	01871145852	
	Reyad Tea Stall	1500	01834686701	
	Vai Vai Store	2500	01818441881	
	Shahid Halim Shop	3998	01874014496	
	Hanif Pant Dokan	2000	01938278418	19977510763000237
	Nurul Banana Van	2500	01866590950	
	Faruk sandal Shop	2000	01756382653	9196216282794
	Saiful Clothing’s	2000	01882774573	
	Belayet Fruit Vendor	6000	01837320520	19850518785023
	Mojib Tee Stall	7000	01818588925	1594308369871
	Fruit Shop	5000	01828450572	
	Sugarcane Juice Shop	1100	01871560095	
	Md. Mahbub Alam	1500	01841161361	
	Raju Halim	6000	01876289913	
	MamaHalim	7000	01879723037	
	Shahbuddin Jhal Dokan (Spicy Food)	7000	01863380092	
	Razvi FruitVendor	8000	01814786888	6880448565
	Cosmetics Shop	4000	01643424523	
	Jashim Store	7000	01610168046	
	Fruits Corner	3000	01864833663	
	Sujon Barua	2500	01925798622	
	RahimStore	1400	01827528436	

List of Probable Affected Persons of the Tower Footing Locations (in terms of Right of Records)

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ শাহামিরপুর, জেএলঃ ২৮

উপজেলাঃ বন্দর, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	আ: খালেক, পিতা: ছরফ উদ্দীন, সাং-শাহামিরপুর	শাহামিরপুর	২৮	৫৩৪৬	বিএস	১৯১	০৪ শতাংশ	নাল	
২.	নজির আহম্মদ, পিতা: আব্দুল লতিফ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৩.	আবদুল ছামাদ, পিতা: ইমাম উদ্দীন, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৪.	আবদুল ছোবান, পিতা: ইমাম উদ্দীন, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৫.	কুল মেহের, জং: আবদুল গণি, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৬.	আমিনা খাতুন, জং: আমিনুল হক, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৭.	মোহাম্মদ ইছাহাক, পিতা: আবদুল আজিজ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৮.	ইমা আমিন, পিতা: আবদুল আজিজ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
৯.	আ: খালেক, পিতা: ছরফ উদ্দীন, সাং-শাহামিরপুর	শাহামিরপুর	২৮	৫৩৪৮	বিএস	১৯১	০৭ শতাংশ	নাল	
১০.	নজির আহম্মদ, পিতা: আব্দুল লতিফ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
১১.	**আবদুল ছামাদ, পিতা: ইমাম উদ্দীন**, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
১২.	**আবদুল ছোবান, পিতা: ইমাম**	শাহামিরপুর	২৮		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
	উদ্দীন, সাং-শাহামিরপুর								
১৩.	**কুল মেহের, জং: আবদুল গণি**, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
১৪.	আমিনা খাতুন, জং: আমিনুল হক, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
১৫.	মোহাম্মদ ইছাহাক, পিতা: আবদুল আজিজ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
১৬.	ইমা আমিন, পিতা: আবদুল আজিজ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস			নাল	
১৭.	ইন মোহাম্মদ, জং: নুর আহাম্মদ, সাং-শাহামিরপুর	শাহামিরপুর	২৮	৫৩৫৬	বিএস	১০২৮	০৬ শতাংশ	নাল	
১৮.	ইন মোহাম্মদ, জং: নুর আহাম্মদ, সাং-শাহামিরপুর	শাহামিরপুর	২৮	৫৩৪৯	বিএস	১০২৮	০৬ শতাংশ	নাল	
১৯.	জরিমন খাতুন, জং-মকবুল আহাম্মদ, সাং-শাহামিরপুর	শাহামিরপুর	২৮	৫৩৫০	বিএস	১৫৯৯	১৫ শতাংশ	নাল	
২০.	সিদ্দিক আহাম্মদ, পিতা: আকান্দ আহাম্মদ, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস				
২১.	আজিজুল হক, চান মোহাম্মদ, পিতা: নুর আহাম্মদ, সাং-শাহামিরপুর	শাহামিরপুর	২৮	৫৩৫৫	বিএস	১৪৯৬	০৪	নাল	
২২.	ইউছুপ আহাম্মদ, পিতা: জামাল উদ্দিন, সাং-শাহামিরপুর	শাহামিরপুর	২৮		বিএস				

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ শিকলবাহা, জেএলঃ ৮

উপজেলাঃ পটিয়া, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	আলতাব মিয়া, পিতা: আশরাফ আলী, সাং- শিকলবাহা	শিকলবাহা	৮	৬৮৪৪	বিএস	২৬৯	২৮ শতাংশ	নাল	
২.	আলতাব মিয়া, পিতা: আশরাফ আলী, সাং- শিকলবাহা	শিকলবাহা	৮	৬৮৪৬	বিএস	২৬৯	৩২	নাল	
৩.	রাবেয়া খাতুন, জং: ইমাম শরিপ, সাং- শিকলবাহা	শিকলবাহা	৮	৬৮৪৫	বিএস	২৯২৯	১৩ শতাংশ	নাল	
৪.	সাহা আলম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
৫.	নূরুল ইসলাম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
৬.	আনোয়ার ইসলাম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
৭.	নূরুল আলম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
৮.	জাগির আহাম্মদ, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮	৬৮৫৬	বিএস	৩০৬৭	১৭	নাল	
৯.	মোহাম্মদ হাছন আলী, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১০.	মোহাম্মদ জনাপ আলী, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১১.	মনোয়ারা বেগম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১২.	মমতাজ বেগম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১৩.	খতিজা বেগম, পিতা-আবদুল	শিকলবাহা	৮		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
	মুনাপ, সাং- শিকলবাহা								
১৪.	জাহানারা বেগম, পিতা-আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১৫.	জরিনা খাতুন, জং- আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১৬.	লিলিয়ারা বেগম, জং- আবদুল মুনাপ, সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১৭.	নূর জাহান বেগম, জং- মনু মিয়া সাং- শিকলবাহা	শিকলবাহা	৮		বিএস			নাল	
১৮.	ছৈয়দ মুনাফ, পিতা: তমিজ উদ্দিন, সাং- শিকলবাহা	শিকলবাহা	৮	৬৮৫৭	বিএস	১৫৯৪	১৮ শতাংশ	নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ চরলক্ষ্যা, জেএলঃ ১৩

উপজেলাঃ পটিয়া/বন্দর, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	আবদুল আজিম, পিতা: আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২.	আবদুল ছত্তর, পিতা: আমিন শরিফ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩.	আব্দুল জব্বর, পিতা: আমিন শরিফ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৪.	আবদুর রহমান, পিতা: নজির আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৫.	অলি আহাম্মদ, পিতা: আছমত আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৬.	ফজল আহাম্মদ, পিতা: আছমত আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৭.	হাজী বেলায়েত আলী, পিতা: ফতে আলী	চরলক্ষ্যা (পটিয়া)	১৩	২৩৪৬	বিএস	৩৫৭	০৮ শতাংশ	নাল	
৮.	মফিজ উল্যা, পিতা: ফতে আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৯.	আমিন উল্যা, পিতা-ফতে আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১০.	আবদুল বারিক, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১১.	আবদুল মালেক, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১২.	মোহাম্মদ হোসেন, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১৩.	ছৈয়দ আহাম্মদ, পিতা- আলী	চরলক্ষ্যা	১৩		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
	আহাম্মদ	(পটিয়া)							
১৪.	গণু মিয়া, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১৫.	আবদুল আজিম, পিতা: আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১৬.	আবদুল ছত্তর, পিতা: আমিন শরিফ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১৭.	আব্দুল জব্বর, পিতা: আমিন শরিফ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১৮.	আবদুর রহমান, পিতা: নজির আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
১৯.	অলি আহাম্মদ, পিতা: আছমত আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২০.	ফজল আহাম্মদ, পিতা: আছমত আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২১.	হাজী বেলায়েত আলী, পিতা: ফতে আলী	চরলক্ষ্যা (পটিয়া)	১৩	২৩৪৭	বিএস	৩৫৭	২০	নাল	
২২.	মফিজ উল্যা, পিতা: ফতে আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২৩.	আমিন উল্যা, পিতা-ফতে আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২৪.	আবদুল বারিক, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২৫.	আবদুল মালেক, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২৬.	মোহাম্মদ হোসেন, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
২৭.	ছৈয়দ আহাম্মদ, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
২৮.	গণু মিয়া, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)			বিএস			নাল	
২৯.	আবদুল আজিম, পিতা- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩	২৩৪৮	বিএস	৩৫৮	০৬	নাল	
৩০.	আবেদা খাতুন, জং- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩১.	আবদুল জব্বার, পিতা: আমিন শরিপ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩২.	আবদুল ছত্তার, পিতা: আমিন শরিপ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩৩.	আবদুল আজিম, পিতা: আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩	২৩৪৯	বিএস	৩৫৮	৩১	নাল	
৩৪.	আবেদা খাতুন, জং- আলী আহাম্মদ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩৫.	আবদুল জব্বার, পিতা: আমিন শরিপ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩৬.	আবদুল ছত্তার, পিতা: আমিন শরিপ	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩৭.	নূরুল ইসলাম, পিতা: ছাখায়ত মিয়া	চরলক্ষ্যা (পটিয়া)	১৩	২৮৪৪	বিএস	৯৫৭	৩০ শতাংশ	নাল	
৩৮.	খলিল মিয়া, পিতা: আমানত আলী	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৩৯.	মোহাম্মদ ইলিয়াস মিঞা, পিতা: মোহাম্মদ নূও মিঞা	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৪০.	নূরুল আলম, পিতা: আলী বকস	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৪১.	জানে আলম, পিতা: আলী বকস	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	
৪২.	নূরজাহান বেগম, জং- আলী বকস	চরলক্ষ্যা (পটিয়া)	১৩		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
৪৩.	জুলেখা খাতুন, জং- তালেব আলী, সাং- গোসাইলডাঙ্গা	চরলক্ষ্যা (বন্দর)	১৩		বিএস			নাল	
৪৪.	আবদুল কাদের, পিতা: বাহা মিঞা, সাং- মধ্য হালিশহর	চরলক্ষ্যা (বন্দর)	১৩		বিএস			নাল	
৪৫.	ছিদ্দিক আহাম্মদ, পিতা: অছি মিঞা	চরলক্ষ্যা (বন্দর)	১৩	১২১৬৫	বিএস	৬৭৪	১৭ শতাংশ	নাল	
৪৬.	আবদুল খালেক, পিতা: সরফত আলী, সাং- কদুরখিল	চরলক্ষ্যা (বন্দর)	১৩		বিএস			নাল	
৪৭.	ফয়েজা খাতুন, জং- ছালে আহাম্মদ, সাং- হালিশহর	চরলক্ষ্যা (বন্দর)	১৩		বিএস			নাল	
৪৮.	মো: শরিপ, পিতা: বাকর আলী	চরলক্ষ্যা (বন্দর)	১৩	১২১৬৬	বিএস	১০১৮	১৬ শতাংশ	নাল	
৪৯.	ময়মুনা খাতুন, জং- মনির উদ্দিন, সাং- জুলধা	চরলক্ষ্যা (বন্দর)	১৩	১২১৬৭	বিএস	১০১৮	৩০ শতাংশ	বাড়ী	
৫০.	মোহাম্মদ লোকমান, পিতা: ইমাম শরিফ, সাং- মধ্য হালিশহর	চরলক্ষ্যা (বন্দর)	১৩	১৩১৬৪	বিএস	৯৮১	২০ শতাংশ	নাল	
৫১.	হোছেন আহাম্মদ, পিতা: হামিদ উদ্দিন, সাং- জুলধা	চরলক্ষ্যা (বন্দর)	১৩	১৩১৬৫	বিএস	১০৯৫	১০ শতাংশ	নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ গোবাদিয়া, জেএলঃ ৩২

উপজেলাঃ বন্দর, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	আবদুল গণি চৌধুরী. পিতা: অছি মিয়া চৌধুরী	গোবাদিয়া	৩২	১৫১	বি এস	০৬	৯৮ শতাংশ	নাল	
২.	আবদুল গণি চৌধুরী. পিতা: অছি মিয়া চৌধুরী	গোবাদিয়া	৩২	১৫২	বি এস	০৬	৮০ শতাংশ	নাল	
৩.	বাংলাদেশ সরকারের পক্ষে ডেপুটি কমিশনার, চট্টগ্রাম	গোবাদিয়া	৩২	১৫৩	বি এস	০১	১৯ শতাংশ	পথ	
৪.	বাংলাদেশ সরকারের পক্ষে ডেপুটি কমিশনার, চট্টগ্রাম	গোবাদিয়া	৩২	১৫৪	বি এস	০১	০৮শতাংশ	পথ	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মোট জমির পরিমানঃ

মৌজাঃ বৈরাগ, জেএলঃ ৩

উপজেলাঃ আনোয়ারা, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	মফিজজর রহমান, পিতা: হেদায়েত আলী	বৈরাগ	৩	২০৩৬	বিএস	১৬২০	৬২ শতাংশ	নাল	
২.	শেখ হোসেন, পিতা: মখলেছুর রহমান	বৈরাগ	৩	৩৮৬৩	বিএস	১১৯০	৩০	নাল	
৩.	মোহাম্মদ আলী, পিতা: শের আলী	বৈরাগ	৩	৩৮৬৫	বিএস	১১৯০	১২	নাল	
৪.	মমতাজ বেগম, পিতা: আজিজুর রহমান								
৫.	শকুনতাজ বেগম, পিতা: আজিজুর রহমান	বৈরাগ	৩		বিএস				
৬.	সিদ্দিক আহাম্মদ, পিতা: সুলতান আহাম্মদ	বৈরাগ	৩	৩৮৬৪	বিএস	১০৬৬	১৭	নাল	
৭.	অছিয়র রহমান, পিতা: রমিজ উদ্দিন	বৈরাগ	৩	৩৮৬২	বিএস	০৯	৭	নাল	
৮.	আবদুল শুকুর, পিতা: এমরান আলী, সাং- বন্দর	বৈরাগ	৩		বিএস				
৯.	আরবান আলী, পিতা: মনহোর আলী	বৈরাগ	৩	৩৮৬৭	বিএস	৫৭৪	১২	নাল	
১০.	মজলিশ খান, পিতা: আজিজুর রহমান	বৈরাগ	৩	৩৮৬১	বিএস	১৫৯৬	০৯	নাল	
১১.	বদরুজ্জামান, পিতা: লাল মিয়া	বৈরাগ	৩		বিএস				

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১২.	নিজামত আলী, পিতা: এয়াকুব আলী	বৈরাগ	৩		বিএস			নাল	
১৩.	নিয়ামত আলী, পিতা: এয়াকুব আলী	বৈরাগ	৩		বিএস			নাল	
১৪.	আবদুস সালাম, পিতা কেরামত আলী	বৈরাগ	৩		বিএস			নাল	
১৫.	রোকেয়া খাতুন, পিতা কেরামত আলী	বৈরাগ	৩	৩৮৬০	বিএস	১৩৬০	৭	নাল	
১৬.	রওশনয়ারা, পিতা কেরামত আলী	বৈরাগ	৩		বিএস			নাল	
১৭.	গোলতাজ খাতুন, জং- কেরামত আলী	বৈরাগ	৩		বিএস			নাল	
১৮.	মজলিশ খাঁ, পিতা: আজিজুর রহমান	বৈরাগ	৩		বিএস			নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ দুদকুমড়া, জেএলঃ ১৩

উপজেলাঃ আনোয়ারা, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	আবদুস ছোবাহান, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩	৫৭	বিএস	১৪৫	০৯	নাল	
২.	আবদুল গফুর, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
৩.	আবদুল মালেক, পিতা: আলতাপ মিয়া, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
৪.	মাবিয়া খাতুন, জং- মনু মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
৫.	কাজলী খাতুন, জং- আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
৬.	আবদুস ছোবাহান, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩	৪৮	বিএস	১৪৭	১১	নাল	
৭.	আবদুল গফুর, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
৮.	আবদুল মালেক, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
৯.	আবদুস ছোবাহান, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩	৫৫	বিএস	১৪৭	৫	নাল	
১০.	আবদুল গফুর, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	
১১.	আবদুল মালেক, পিতা: আলতাপ মিঞা, সাং- বোয়ালিয়া	দুদকুমড়া	১৩		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১২.	সুলতান খাঁ, পিতা: ফকির মামুদ, সাং- গোবাদিয়া	দুদকুমড়া	১৩	৫৬	বিএস	১০৮৫	০৯	নাল	
১৩.	আবুল কাশেম, পিতা: এমাজ মাসুদ	দুদকুমড়া	১৩	১৫০	বিএস	২৫৬	৪২	নাল	
১৪.	নূর ইসলাম, পিতা: এমাজ মাসুদ	দুদকুমড়া	১৩		বিএস			নাল	
১৫.	ছৈয়দ আহাম্মদ, পিতা: এমাজ মাসুদ	দুদকুমড়া	১৩		বিএস			নাল	
১৬.	আবুল কালাম, পিতা: এমাজ মাসুদ	দুদকুমড়া	১৩		বিএস			নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ কৈনপুরা, জেএলঃ ৪২

উপজেলাঃ আনোয়ারা, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	মনিন্দ্র মহাজন, পিতা: প্রসন্ন মহাজন, সাং- দৌলতপুর	কৈনপুরা	৪২	১৩৪	বিএস	১১৪৯	৬	নাল	
২.	মানিক্য মহাজন, পিতা: প্রসন্ন মহাজন, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৩.	মনোরঞ্জ মহাজন, পিতা: প্রসন্ন মহাজন, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৪.	বোজেন্দ্র মহাজন, পিতা: প্রসন্ন মহাজন, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৫.	শুধাংশু বিমল মহাজন, পিতা: ঈশ্বরচন্দ্র মহাজন, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৬.	রুক্ষিণী কর, পিতা: সারদা চরন কর, সাং- দৌলতপুর	কৈনপুরা	৪২	১০৭	বিএস	১৩৯৩	৬	নাল	
৭.	চন্দ্রকুমার কর, পিতা: সারদা চরন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৮.	চিন্তা হরণ কর, পিতা: প্রমোদ রঞ্জন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৯.	নারায়ন কর, পিতা: প্রমোদ রঞ্জন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
১০.	হরিধন কর, পিতা: প্রমোদ রঞ্জন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
১১.	বলরাম কর, পিতা: বরদা চরন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১২.	ধনঞ্জয় কর, পিতা: বরদা চরন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
১৩.	কালী কুমার কর, পিতা: বরদা চরন কর, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
১৪.	দেবেন্দ্র লাল শীল, পিতা: মহেশ চন্দ্র শীল, সাং- দৌলতপুর, পটিয়া	কৈনপুরা	৪২	১৯০	বিএস	৭২৩	২৬	নাল	
১৫.	কবির আহাম্মদ, পিতা: আকিমদ্দিন, সাং- দৌলতপুর	কৈনপুরা	৪২	১০৫	বিএস	৪২৬	৪৬	নাল	
১৬.	বেদুনি খাতুন, জং- বাছা মিয়া, সাং দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
১৭.	মোহাম্মদ কাশেম, পিতা: মোহাম্মদ সাহর মুল্লুক	কৈনপুরা	৪২	১৩৩	বিএস	৪৬৪	১৯	নাল	
১৮.	পরিমল চন্দ্র শীল, জং- সারদা চরণ শীল, সাং- দৌলতপুর	কৈনপুরা	৪২	১২৩	বিএস	৮৫৬	৪০	নাল	
১৯.	মায়াশ্বরী শীল, জং- সারদা চন্দ্র শীল, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
২০.	বিমল চন্দ্র শীল, পিতা: হরমোহন শীল, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
২১.	গুধীর চন্দ্র শীল, পিতা: হরমোহন শীল, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
২২.	পরিমল চন্দ্র শীল, জং- সারদা চরণ শীল, সাং- দৌলতপুর	কৈনপুরা	৪২	১২০	বিএস	৮৫৬	৯	নাল	
২৩.	মায়াশ্বরী শীল, জং- সারদা চন্দ্র শীল, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
২৪.	বিমল চন্দ্র শীল, পিতা: হরমোহন শীল, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
২৫.	গুধীর চন্দ্র শীল, পিতা: হরমোহন	কৈনপুরা	৪২		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
	শীল, সাং- দৌলতপুর								
২৬.	মোহাম্মদ নুরুল ইসলাম, পিতা: জানে আলম, সাং- আলকরণ	কৈনপুরা	৪২	১৩২	বিএস	৮৪৩	৩৯	নাল	
২৭.	মাতিয়ার রহমান, পিতা: মোবারক আলী, সাং-দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
২৮.	খলিলের রহমান, পিতা: মোবারক আলী, সাং- দৌলতপুর	কৈনপুরা	৪২	১৩৫	বিএস	১২৭১	২৯	নাল	
২৯.	আবদুর রহমান, পিতা: মোবারক আলী, সাং- দৌলতপুর	কৈনপুরা	৪২		বিএস			নাল	
৩০.	নিরোধ চন্দ্র ধর, পিং- মহেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩১.	হিমাংশু বিমল ধর, পিং- মহেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩২.	সারদা চরন , পিং- কেবল কৃষ্ণ, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩৩.	বিনোদ বিহারী ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩৪.	জুধাংশু শিকল ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩৫.	সুখন্তি ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২	১০৮	বিএস	৭৯২	২৪	নাল	
৩৬.	নিরঞ্জন ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩৭.	মন্টু ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩৮.	বঙ্কিম কুমার ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৩৯.	পেটিন ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
৪০.	নিরোধ চন্দ্র ধর, পিং- মহেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২	১০৯	বিএস	৭৯২	২২	নাল	
৪১.	হিমাংশু বিমল ধর, পিং- মহেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪২.	সারদা চরন , পিং- কেবল কৃষ্ণ, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪৩.	বিনোদ বিহারী ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪৪.	জুধাংশু শিকল ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪৫.	সুখন্তি ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪৬.	নিরঞ্জন ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪৭.	মন্টু ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	
৪৮.	বঙ্কিম কুমার ধর, দেবেন্দ্র ধর, সাং- বড় উঠান				বিএস	৭৯২		নাল	
৪৯.	পেটিন ধর, দেবেন্দ্র ধর, সাং- বড় উঠান	কৈনপুরা	৪২		বিএস	৭৯২		নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ চাতুরীয়া, জেএলঃ ৪১

উপজেলাঃ আনোয়ারা, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১.	ছালে আহাম্মদ, পিতা: আহাম্মদ আনজু মিয়া,	চাতুরীয়া	৪১	৬৬	বিএস	৮৭৫	১০	নাল	
২.	আবদুল ছাত্তার, পিতা: আহাম্মদ আনজু মিয়া	চাতুরিয়া	৪১		বিএস				
৩.	কামাল উদ্দীন খাঁ, পিতা: ফজলের রহমান, সাং- বড় উঠান	চাতুরিয়া	৪১	৬৭	বিএস	৩৮৩	১১	নাল	
৪.	ছাইফুদ্দিন খাঁ, পিতা: ফজলের রহমান, সাং- বড় উঠান	চাতুরীয়া	৪১		বিএস			নাল	
৫.	নুরুল আলম, পিতা: অছিয়র রহমান, সাং- বড় উঠান	চাতুরিয়া	৪১		বিএস			নাল	
৬.	জহুরুল আলম, পিতা: অছিয়র রহমান, সাং- বড় উঠান	চাতুরিয়া	৪১		বিএস			নাল	
৭.	আবদুল হামিদ মাসুদ, পিতা: অছিয়র রহমান, সাং- বড় উঠান	চাতুরীয়া	৪১		বিএস			নাল	
৮.	ফছিউল আলম, পিতা: অছিয়র রহমান, সাং- বড় উঠান	চাতুরিয়া	৪১		বিএস			নাল	
৯.	আজিজুল হক, পিতা: আজিজুর রহমান, সাং- বড় উঠান	চাতুরিয়া	৪১		বিএস			নাল	
১০.	মাহফুজুল হক খাঁ, পিতা: আজিজুর রহমান, সাং- বড় উঠান	চাতুরীয়া	৪১		বিএস			নাল	
১১.	এমদাদুল হক খাঁ, পিতা: আজিজুর রহমান, সাং- বড় উঠান	চাতুরিয়া	৪১		বিএস			নাল	
১২.	এজাহারুল হক খাঁ, পিতা:	চাতুরিয়া	৪১		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
	আজিজুর রহমান, সাং- বড় উঠান								
১৩.	আমান উল্যা খাঁ, পিতা: শের আলী খাঁ, সাং- বড় উঠান	চাতুরীয়া	৪১	৬৮	বিএস	৩৮৩	১৯	নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ দৌলতপুর, জেএলঃ ১৭

উপজেলাঃপটিয়া , জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১	আলতাফমিয়া,পিংকাদেরমিয়া, সাংকৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
২	আব্দুলআজিম,পিংকাদেরমিয়া, সাংকৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
৩	আবদুলহামিদ ,পিংকাদেরমিয়া, সাংকৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
৪	আবদুলছবুর,পিংমোহাম্মদনাছিম ,সাংকৈগ্রাম	দৌলতপুর	১৭	৩৮৭০	বিএস	৫৮৫	১৮	নাল	
৫	আবদুলগনি, পিংমোহাম্মদনাছিম ,সাংকৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
৬	নাজিরআহাম্মদ, পিংআছিইয়ররহমান, সাংকৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
৭	আবুলখায়ের,	দৌলতপু	১৭		বিএস			নাল	

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
	পিংআনজুমিয়া,সাংকৈগ্রাম	র							
৮	আলীআহাম্মদ, পিংআনজুমিয়া,সাংকৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
৯	মাহাবুবআলী,পিংআবদুররশিদ , কৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
১০	আবদুলসালাম, পিংনুরউদ্দিন, কৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	
১১	এয়ারমোহাম্মদ, পিংআবদুররহমান, কৈগ্রাম	দৌলতপুর	১৭		বিএস			নাল	আপোষবণ্টনসুত্রেঅত্রখতিয়ানেআলতাফগংওনাজিরগংআরদখলেনাই।

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ দৌলতপুর, জেএলঃ ১৭

উপজেলাঃপটিয়া , জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১	এজাহারমিয়া, পিংমতিউররহমান, সাংনিজ	দৌলতপুর	১৭	৩৮৭১	বিএস	৮১৬	৩	নাল	
২	আবদুলহাকিম, পিংনুরআহাম্মদ,সাংনিজ	দৌলতপুর	১৭		বিএস				
৩	আবদুলজব্বারপিংনুরআহাম্মদ,সাংনিজ	দৌলতপুর	১৭		বিএস				
৪	এজাহারমিয়া, পিংমতিউররহমান, সাংনিজ	দৌলতপুর	১৭	৩৮৭২	বিএস	৮১৪	১২	নাল	
৫	আবদুলহাকিম, পিংনুরআহাম্মদ,সাংনিজ	দৌলতপুর	১৭	৪৩৫৩	বিএস	৪২২	১৪	নাল	
৬	আবদুলজব্বারপিংনুরআহাম্মদ,সাংনিজ	দৌলতপুর	১৭	৪৩৪২	বিএস	৪২৩	১৪	নাল	
৭	আবদুলহাকিম, পিংনুরআহাম্মদ,সাংনিজ	দৌলতপুর	১৭		বিএস				
৮	আবদুলজব্বারপিংনুরআহাম্মদ,সাংনিজ	দৌলতপুর	১৭		বিএস				
৯	জরিজান ,জংআবদুলজলিল,সাংশিবলবাহা	দৌলতপুর	১৭		বিএস				
১০	জিবজানবিবি, জংআলামিঞা ,সাংশিবলবাহা	দৌলতপুর	১৭		বিএস				
১১	সুলতানআহাম্মোদ,পিংইজ্জতআলী, সাংনিজ	দৌলতপুর	১৭	৪৩৫৬	বিএস	১৭৭৪	৯	নাল	
১২	আলাউদ্দিন,রশিদআহাম্মদ, পিংআছদআলী ,সাংনিজ	দৌলতপুর	১৭	৪৩৫৭	বিএস	৫৯২	২২	নাল	
১৩	আবদুলনবী, পিংআবদুলজলিলসাংনিজ	দৌলতপুর	১৭	৩৮৭৩	বিএস	৩৫৯	১২	নাল	

১৪	বদরজামান, পিংহামিদআলীসাংনিজ	দৌলতপুর	১৭	৪৩৫৪	বিএস	১৪৩১	১৬	নাল	
১৫	জামালউদ্দিন ,পিংরমজানআলীসাংনিজ	দৌলতপুর	১৭	৪৩৫৫	বিএস	১০৯৭	১৩	নাল	
১৭	মোছলেমাখাতুন ,জংনাজিরআহাম্মদ ,সাংনিজ	দৌলতপুর			বিএস				
১৮	মোকরমখাতুনজং , মোহাম্মদসরিফ ,সাংনিজ	দৌলতপুর			বিএস				
১৯	নাজমাখাতুন,জংফজলকরিমসাংনিজ	দৌলতপুর			বিএস				
২০	মোহাম্মদসরিফ ,পিংবাছামিঞাসাংনিজ	দৌলতপুর			বিএস				
২১	সুলতানাবেগম ,জংমোহাম্মদমছলেমসাংনিজ	দৌলতপুর			বিএস				
২২	মোহাম্মদএছাহাক ,পিংগুড়ানআলীসাংনিজ	দৌলতপুর			বিএস				
২৩	মুলাবিবি ,জংগুড়ানআলী ,সাংনিজ	দৌলতপুর			বিএস				
২৪	রহমানখাতুন ,জংহামদুমিয়া ,সাংনিজ	দৌলতপুর			বিএস				

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ ডাঙ্গারচর জেএলঃ ১৭

উপজেলাঃ বন্দর, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১	আবুলইসলাম, পিংমনিরুল্লাহ, সাংনিজ	দাংগার	২২	৬১	বিএস	৩২০	২	কাটি	
২	আবদুলহকদোভাষী	দাংগার			বিএস	৫৮৭	৭	নাল	
৩	আবুলইসলাম, পিংমনিরুল্লাহ, সাংনিজ	দাংগার	২২	৬৩	বিএস	৩২০	১একর৩৭শতাংস	নাল	
৪	সিদ্দিকআহাম্মদ , পিংহানিফমিয়া	দাংগার	২২	১১৪	বিএস	২৬৭	৫০	নাল	
৫	আবদুলসালাম , পিংসিদ্দিকআহাম্মদ,সাংনিজ	দাংগার	২২	১১৫	বিএস	১১০	৫১	নাল	
৬	সিদ্দিক, পিংহানিফমিয়া, সাংনিজ	দাংগার	২২	১১৬	বিএস	২৬৭	৩০	নাল	
৭	বাদশামিয়া, পিংআবদুররহিম, সাংনিজ	দাংগার	২২	৫৪২	বিএস	৩৯৭	২একর৫৬শতাংস	নাল	খাসখতিয়ান৯শতাংস
৮	বদিউররহমান, পিংইয়াকুবআলীসাংনিজ	দাংগার	২২	৫৫৩	বিএস	৩৮৯	৬একর৮৭শতাংস	নাল	

চট্টগ্রাম অঞ্চলের অধীনে বিদ্যুৎ সিস্টেম নেটওয়ার্ক সম্প্রসারণ ও শক্তিশালীকরণ প্রকল্পের আওতায় ভূগর্ভস্থ এবং ওভারহেড ট্রান্সমিশন লাইনের ক্ষয়ক্ষতি নিরূপণের জরীপ এর প্লট ও দাগ অনুযায়ী জমির সম্ভাব্য মালিকের তালিকা নিম্নে দেওয়া হল

মৌজাঃ বন্দর , জেএলঃ ১৭

উপজেলাঃজুলধা, জেলাঃ চট্টগ্রাম।

ক্রমিক নং	পরিবার প্রধান এর নাম পিতা/ স্বামীর নাম ঠিকানাসহ	মৌজা	জেএল নং	প্লট/ দাগ নং	খতিয়ানের ধরণ (এসএ/সিএস/আরএস/বিএস)	খতিয়ান নং	মোট জমি দাগ/প্লট অনুযায়ী (শতাংশ)	জমির ধরণ	মন্তব্য
১	আম্পারুজ্জামান, পিংমকবুলআলী, সাংনিজ	**জুলধা**	২৭		বিএস	৫৮৩	৩	নাল	
২	মোহাম্মদসরিফ,পিং, বাকেরআলীসাংনিজ	**জুলধা**	২৭		বিএস				
৩	মোহাম্মদহাশেম,পিংআহাম্মদমিয়া, সাংনিজ	**জুলধা**	২৭		বিএস				
৪	ছলেমান ,পিংআহাম্মদমিয়া, সাংনিজ	**জুলধা**	২৭	৮৬০২	বিএস				
৫	মস্তফাখাতুন, জংআহাম্মদমিয়া, সাংনিজ	**জুলধা**	২৭		বিএস				
৬	জব্বারহোসেন,পিংমজরউল্লা ,সাংনিজ	**জুলধা**	২৭		বিএস				
৭	নুরুলআলম,পিংআবদুলজলিল,সাংনিজ	**জুলধা**	২৭		বিএস				
৮	**নুরুলইসলাম,** পিংআবদুলজলিল,সাংনিজ	**জুলধা**	২৭		বিএস	১৪৪৭	১০	নাল	
৯	**ফজলআহাম্মস, পিংআবদুলরশিদ,সাংনিজ**	**জুলধা**	২৭		বিএস				
১০	**মোহাম্মদআলী, পিংআবদুলরশিদ,সাংনিজ**	**জুলধা**	২৭	৮৬২৩	বিএস				
১১	**আফিয়াখাতুন , পিংআবদুলরশিদ,সাংনিজ**	**জুলধা**	২৭		বিএস				

১২	করিমজান ,জং**আবদুলরশিদ,সাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
১৩	**গুনুমিয়া, পিংমির্জাআলী,সাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
১৪	**মোহাম্মদশরিফ,পিংবারেকআলী,সাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
১৫	**আজিজেররহমান,পিংমোহাব্বতআলী ,সাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
১৬	**আবদুলছবুর,পিংমফিজেররহমানসাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
১৭	**আবদুলগফুর, পিংমফিজেররহমানসাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
১৮	**আলতাপমিয়া, পিং**ফজরেররহমান ,সাংনিজ	**জুলধা**	**২৭**		**বিএস**				
১৯	**আলমাছখাতুন, জংখায়েরআহাম্মদ, সাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
২০	**আবদুলছাত্তার,পিংআবদুলকাদের, সাংনিজ**	**জুলধা**	**২৭**	**৮৬০২**	**বিএস**	**২৯০**	**১২**	**নাল**	
২১	**মোহাম্মদসরিফ,পিংবাকেরআলী, সাংনিজ**	**জুলধা**	**২৭**		**বিএস**				
২২	**ফজলআহাম্মদ,**পিংআবদুলজলিল,সাংনিজ	**জুলধা**	**২৭**		**বিএস**				
২৩	**মহাম্মদআলী,** পিংআবদুলজলিল,সাংনিজ	**জুলধা**	**২৭**		**বিএস**				
২৪	**আলতাপমিয়া, পিং**ফজরেররহমান ,সাংনিজ	**জুলধা**	**২৭**		**বিএস**				

২৫	আজিজেররহমান,পিংমোহাব্বতআলী ,সাংনিজ	জুলধা	২৭		বিএস				
২৬	আবদুলছবুর,পিংমফিজেররহমানসাংনিজ	জুলধা	২৭		বিএস				
২৭	আবদুলগফুর, পিংমফিজেররহমানসাংনিজ	জুলধা	২৭		বিএস				
২৮	ছলেমান ,পিংআহাম্মদমিয়া, সাংনিজ	জুলধা	২৭		বিএস				
২৯	মোহাম্মদহাশেম,পিংআহাম্মদমিয়া, সাংনিজ	জুলধা	২৭		বিএস				
৩০	ছাবিয়াখাতুন,জংইছাহাক,সাংনিজ	জুলধা	২৭		বিএস				
৩১	জেবলহোসেন, পিংনুরআহাম্মদ ,সাংনিজ	জুলধা	২৭	৮৬২২	বিএস	১১৬৮	২১	নাল	

Appendix –V: Layout of Proposed Substation