Initial Environmental Examination

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SRI: Green Power Development and Energy Efficiency Improvement Investment Program – Tranche 2 (Transmission Infrastructure Enhancement)

Prepared by Ceylon Electricity Board, Ministry of Power and Renewable Energy, Democratic Socialist Republic of Sri Lanka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 22 July 2016)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	$0.00684
$1.00	=	SLRs146.03

ABBREVIATIONS

ADB	–	Asian Development Bank
CCD	–	Coast Conservation Department
CEA	–	Central Environment Authority
CEB	–	Ceylon Electricity Board
DC or D/C	–	Double Circuit
DPR	–	Detailed Project Report
DSD	–	Divisional Secretariat Divisions
EA	–	Executing Agency
EARF	–	Environmental Assessment and Review Framework
EIA	–	Environmental Impact Assessment
EMoP	–	Environmental Monitoring Plan
EMP	–	Environmental Management Plan
EHV	–	Extra High Voltage
GHG	–	Green House Gas
GND	–	Gram Niladhari Divisions
GoSL	–	Government of Sri Lanka
GRC	–	Grievance Redress Committee
GRM	–	Grievance Redress Mechanism
GSS	–	Grid Sub Station
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
LILO	–	Line – in- Line- out
MFF	–	Multi-tranche Financing Facility
MPRE	–	Ministry of Power and Renewable Energy
PAA	–	Project Approving Authority
PCB	–	Poly Chlorinated Biphenyl
PMU	–	Project Management Unit
GSS	–	Power Sub Station
REA	–	Rapid Environment Assessment
ROW	–	Right of Way
RP	–	Resettlement Plan
SC or S/C	–	Single Circuit
SF_6	–	Sulphur Hexafluoride
SPS	–	Safeguard Policy Statement

WEIGHTS AND MEASURES

ha (hectare)	–	Unit of area
km (kilometer)	–	1,000 meters
kV	–	kilovolt (1,000 volts)
kW	–	kilowatt (1,000 watts)
MW	–	Mega Watt

NOTE{S}
In this report, "$" refers to US dollars.
“SLRs” refers to Sri Lankan rupees

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EXECUTIVE SUMMARY

1. ADB is proposing to extend USD 150 million loan (with UDS 30 million cofinancing from AFD) to Sri Lanka's power sector for Green Power Development and Energy Efficiency Improvement Investment Program (Tranche 2) with a focus to support wind-power development and identify the transmission and distribution projects for evacuation of renewable energy (wind) parks/ projects and overall improvement of energy efficiency and capacity development.

2. The subprojects of Transmission Infrastructure Enhancement of the Green Power Development and Energy Efficiency Improvement Investment Tranche 2 Program include:

T-1	New Polpitiya-Hambantota 220 kV Transmission Development
T-2	Construction of Colombo B 132/11 kV Grid Substation (GSS)
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations
T-4	Padukka – Horana 132 kV Transmission Development
T-5	Construction of Biyagama 220/33 kV Grid Substation
T-6	Augmentation of Dehiwala Grid Substation
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line
T-8	Augmentation of Madampe 132/33 kV Grid substation

3. The Polipitya GSS, Habrana GSS and Padukka GSS were funded under previous ADB projects. The construction of substation involves utilisation of existing CEB lands for 220/33 kV Biyagama, 132/33 kV old Biyagama, Kotugoda and Kolonnawa Old GSSs, 32/11 kV Colombo B GSS, 132/33 kV Madampe GSS. The proposed 220/33 kV Hambantota GSS will be built on 10 acres government land (owned by Mahaweli Authority as shown in the New Zoning Map of the Greater Hambantota Development Area - 2030). The GSS land in Gonnoruwa, Hambantota is within the Managed Elephant Range (MER) and the line is located outside as shown in **Figure 11**. Very small numbers of trees have to be removed from the land at Hambantota GSS. For any sub-project, acquisition of land will not be required from any surrounding communities.

4. In case of construction of new transmission line, the project would involve survey work, forest work and clearance, design and engineering of plant equipment, floating tenders for procurement, civil work related to 220 kV line and 220/132/33 kV GSS testing and commissioning. Total project work is expected to be completed in 36 months.

5. Impacts are manageable and can be managed cost effectively - environmental impacts are likely to result from the proposed project development. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts, that could not be specified or identified at this stage, are taken into account and mitigated where necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes.

6. The proposed project will have number of positive impacts and negative impacts to the existing environment as follows:

- Significant improvement in the quality and reliability of the electricity supply to the project affected area according to current demand is the main positive impact.
- Removal of trees for the transmission line is the main negative impact to the proposed project area.

- Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, disturbance to the farming activities, nuisance from dust, noise, vehicle fumes, black smoke, vibration etc. due to construction activities are the short term negative impacts due to proposed project.
- There will be loss of agricultural productivity due to obstruction and reduce the land of paddy fields as well as cutting of home gardens of coconut and timber trees which will be compensated based on established rates by CEB.

7. Benefits far outweigh negative impacts - The proposed project will improve operational efficiency and quality of power, reliability of the system and at the same time will reduce system losses. Supply of power to both the local areas and regions will boost economic development of the area by strengthening the power transmission infrastructure. Overall, the major social and environmental impacts associated with transmission projects are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices.

8. Various mitigation measures to be taken prior to the project activities are listed in the IEE. Potential adverse environment impacts associated with transmission lines has been avoided or minimised through careful route selection. The alignment is sited away from major settlements, whenever possible, to account for future urban expansion. Forests areas and thick vegetation areas are avoided wherever possible; however, route alignment passes through scrublands, cultivated paddy fields, rubber cultivations, rubber plantations, tea cultivations etc. Approximately 370 forest trees and 6133 fruit/nonfruit/plantation trees will be removed from the Rirght of Way (RoW) of the transmission line.

9. No land acquisition is required for placing transmission towers on private land. However, physical damage to the crops during the construction phase of the project will be compensated at the time of damage as per GoSL norms. Associated impacts on agricultural land will be restricted to the construction phase and will be temporary in nature. Agricultural land will not be lost permanently at the base of the transmission tower. After construction, agricultural land within the transmission corridors can be used again for farming purpose.

10. Since the project does not involve activities that have significant adverse impact, an initial assessment has been done to determine the extent of impact as per the ADB's Safeguard Policy Statement 2009 guidelines. Although the overall Tranche 2 environment category is "A" due to other projects, the environmental classification for this Component is environment Category B. The IEE report conforms to the Ministry of Mahaweli Development and Environment guidelines and regulations and is consistent with ADB's Safeguard Policy Statement (SPS) 2009.

1.0 INTRODUCTION

1.1 Background

1. Sri Lanka has experienced high economic growth in the recent past. With the end of civil conflict in 2009, the country requires sustained focus on post-conflict infrastructure development to remove disparities in economic and social status of the poorer Eastern and Northern provinces. Asian Development Bank(ADB)'s focus on development of power sector infrastructure in partnership with other development partners, contributes to the provision of reliable, adequate, and affordable power supply for sustainable economic growth and poverty reduction in Sri Lanka.

2. The power sector has undergone significant policy level and structural changes in the recent years:

- Sri Lanka Electricity Act passed in Parliament in 2009;
- Assumption of the role of electricity regulator in April, 2009 by the Public Utilities Commission of Sri Lanka (PUCSL);
- Creation of Functional Business Units (FBU's) within the CEB with one unit each for generation and transmission and 4 geographical units for distribution function; and
- All FBU's have been issued licenses by the Public Utilities Commission of Sri Lanka (PUCSL) and they have been filing the tariff petitions since 2010.

3. Sri Lanka's electricity industry is managed by the Ministry of Power & Energy (MPRE). All electricity utilities remain under direct or indirect state ownership, whereas, there is significant private sector participation in power generation. The institutions listed in **Table 1** are active in the electricity industry whereas **Table 2** lists the regulatory and facilitation agencies in Sri Lanka.

Table 1: Institutions in the energy supply industry

Institution	Functions and other information
Government	
Ministry of Power and Renewable Energy (MPRE)	Energy policy, project implementation and monitoring, supervision of state-owned electricity utilities.
Ministry of Petroleum and Petroleum Resource Development (MOPPRD)	Petroleum industry project implementation and monitoring, supervision of state-owned petroleum corporation, petroleum resource development and exploration.
Electricity utilities	
Ceylon Electricity Board (CEB)	State-owned corporation, engaged in power generation (one license, 23 power plants), transmission (one license), and distribution (four licenses, about 4.5 million customers).
Lanka Electricity Company (Pvt) Ltd (LECO)	State-owned company, engaged in power distribution (one license, 450,000 customers) along western and southern coastal regions.
Independent Power Producers (IPPs)	
Ten thermal IPPs to grid, two thermal IPPs in Jaffna mini-grid	Each IPP an individual company, eight diesel power plants and two combined cycles on the main grid, two diesel power plants on the Jaffna mini-grid.
About 100 small renewable energy IPPs (also known as Small Power Producers, SPPs)	Each SPP an individual company, small hydro (about 95), rice-husk (2), and waste-heat (1).
About 300 community small hydro-based distribution cooperatives	About 5000 households are served, in total.
About 120,000 solar home systems	Serving an equal number of households.

Table 2: Regulatory and Facilitation Agencies

Institution	Functions and other information
Sri Lanka Sustainable Energy Authority (SEA)	Policy, promotion and regulatory functions of (i) renewable energy (ii) energy efficiency, and (iii) energy planning, (iv) energy fund management.

Institution	Functions and other information
Public Utilities Commission of Sri Lanka (PUCSL)	Infrastructure regulatory commission presently empowered to regulate (i) electricity industry (ii) bunker and lubricating oil industries. In future, Petroleum Industry regulation is likely to be assigned to PUCSL.

4. Ceylon Electricity Board (CEB) is a corporate body established for development and coordination of the generation, transmission, and distribution of electrical energy in Sri Lanka. It holds six separate licenses for these activities. The license for generation division caters for 66% of the power to the grid. The transmission network consists of 55 GSSs (132/33 kV, 220/132/33 kV, 220/132 kV and 132 /11 kV) and 2,236 km of HV Lines (both 220 kV and 132 kV) approximately.

5. The island is divided into four regions for power distribution, supply and sales, where each distribution division holds a license. These distribution licenses cover more than 97% of the geography of Sri Lanka. Lanka Electricity Company Ltd. (LECO), which is a subsidiary of CEB, covers the remaining areas catering to 478,500 customers. Electricity Distribution Network of CEB consists of MV lines (33 kV and 11 kV), primary substations (33 kV/11 kV), distribution substations (33 kV/400 V and 11 kV/400 V), and LV lines (400 V).

6. ADB is proposing to extend USD 150 million loan (with additional USD 30 million in co-financing) to Sri Lanka's power sector for green power development and energy efficiency improvement in Tranche 2. The specific focus of this assistance is to identify the transmission and distribution projects which could be funded through the proposed loan. The projects identified for the ADB financing are focused on evacuation projects for renewable energy (wind) parks/projects and overall improvement of energy efficiency.

7. The proposed Tranche 2 project will assist GoSL to develop a least-cost project implementation of the following project components:

- Transmission infrastructure enhanced. This includes (a) construction of 144 km of 220 kV and 23.7 km of 132 kV transmission lines, 132 kV in and out connection cable line, and second circuit stringing of 100 km 132 kV Habarana-Valachchenai transmission line; (b) augmentation of existing 220/132/33 kV Biyagama and Kotugoda, 220/33 kV Mannar, Colombo C, Kolonnawa Stanley, 132/33 kV Kolonnawa, Padukka, Horana, Dehiwala and Madampe grid substations; (c) construction of 220/132/33 kV Hambantota, 220/33 kV Naddukuda and Biyagama, and 132/11 kV Colombo B grid substations in the Northern, North Central, Western, and Southern provinces to absorb the increased power demand and ensure stable system operation with intermittent wind and solar generation.
- Efficiency of medium-voltage network improved. This includes (a) construction of 73 km of 33 kV lines in Mahailluppallama, Ethgala, China Bay, Sooriyawewa and Bentota areas, and gantries in Mahailuppallama, Ethgala, China Bay, and Weniwelara areas; and (b) augmentation of 33/11 kV Ethulkotte and Beligahaand primary substation, and construction of 33/11 kV Rattanapitiya primary substation in the Central, Eastern, North Central, Southern and Western provinces to address overloading of conductors and voltage drop in medium- voltage lines.
- Demand-side management for energy efficiency improved. An innovative smart grid and metering pilot subproject, including installation of 10,000 smart meters with the smart metering infrastructure and meter management system, will be developed in the Kantunayake Depot Area in the Western Province.

1.2 Scope of Work and Methodology Adopted

8. The broad scope of the Environmental Assessment study is:

- To conduct field visits to collect data relevant to the study area and also collect secondary data so as to establish the baseline environmental status of the study area;
- To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed project;
- To prepare a mitigation plan outlining the measures for protecting the environment including institutional arrangement and environmental monitoring;
- To identify critical environmental attributes required to be monitored subsequent to the implementation of the proposed project;
- To carry out consultation with local people so as to identify the public perception of the project; and
- To establish the Environment Monitoring Plan (EMoP) for the CEB to submit environmental monitoring reports to ADB at regular intervals.

9. This report is prepared on the basis of survey, field study and with the help of available secondary data. The alignment of line may slightly vary after the exact demarcation of tower location. Accordingly, the field surveys were undertaken to assess physical and biological environment. Detailed assessment of the baseline environment has been conducted for the distance up to 500 m on the either side of proposed alignment and data collection from secondary source has been done to support the findings of the field survey. The field studies were supported by data collected from secondary sources such as internet, forest atlas.

10. The IEE report comprises baseline data on existing physical, ecological, economic, and social condition, together with the anticipated environmental impacts and proposed mitigation measures. Observations were made through transect walk along the transmission line tower locations, as well as in and around the proposed premises for new GSSs from March-April 2016. Public consultations were held with the project affected communities, stakeholders, and government officers that relate to existing environmental conditions around the transmission lines and substations and the potential impacts that could happen due to project implementation. In addition, secondary data was collected from published data from GoSL documents, 2001 population census statistics data, as well as from authorities such as CEB, MPRE and other departments.

11. Based on the Central Environmental Authority (CEA) Guidelines of GoSL, the proposed transmission projects are categorised as “prescribed”. CEB will seek ToR for preparing the Initial Environment Examination (IEE) in prescribed format from CEA for approval and the environmental clearances for the transmission projects from relevant Project Approving Authority (PAA). An initial assessment has been done in this report to determine the extent of impacts as per the ADB’s Safeguard Policy Statement 2009. This IEE report conforms to the Ministry of Environment and Natural Resources guidelines and regulations and is consistent with ADB Operations Manual F1/BP and F1/OP (2003), draft Good Practise Sourcebook (2012)[1] and the ADB’s Safeguard Policy Statement (SPS) 2009.

12. Although the overall environment category for Tranche 2 projects is Category ‘A”, the environmental classification for this Component is environment Category B and does not require an EIA.

[1] A Good Practice Sourcebook (Draft Working Document), December 2012.

2.0 POLICY, LEGAL, AND ADMINSTRATIVE FRAMEWORK

2.1 Applicable Environmental and other Legislations

13. A large number of recurrent and non-recurrent activities under establishment of transmission lines and substations are presently not covered by the National Environmental Act (NEA) as shown in **Table 3**.

Table 3: Applicable Environmental Policy and Procedures

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
Agrarian Services Act (Nº 58 of 1979) Agrarian Development Act Nº 46 of 2000	To provide secure background to farmers and their agricultural premises	Regulates the acquisition of land that belongs to paddy and other activities, which are related to agricultural areas.	The Ministry of Agriculture Development and Agrarian Services
Ceylon Electricity Board Act , 1969	To provide for the establishment of an electricity board for the development and co - ordination of generation	Enters with joint schemes by such board with any government department or approved body for the generation of electrical energy, the irrigation lands, control of floods or other like objects, and to make provision for all matters connected there with or incidental thereto.	Ceylon Electricity Board
Electricity Act 2009	To provide reliable and cheap electrical energy	Regulates the generation, transmission, transformation, distribution, supply and use of electrical energy	Ceylon Electricity Board
Fauna and Flora Protection (Amendment) Act 1993 (Nº 49 of 1993).	To provide greatest protection to fauna and flora	Makes provision for the establishment of protected areas, regulates human involvements to such areas and their fauna and flora.	Department of Wild Life and Department of Forest
Felling of Trees (Amendment Act Nº 01 of 2000 and Act to Amend felling of trees control)	The control removal of trees.	Regulates the removal of trees relevant to type and the compensation	Department of Forest
Fisheries and Aquatic Resources Act 1996	To provide for the management, regulation , conservation and development of fisheries and aquatic resources	Restricts detrimental or risk activities for aquatic fauna and flora	National Aquatic Resources Research & Development Agency (NARA) and CEA
Flood Act Nº 22 of 1955	Protection of areas subject to flood	Flood prevention	Department of Irrigation
Forest Ordinance Act Nº 13 of 1966 Forest (Amendment) Act Nº 65 of 2009	Conservation, protection and management of forest and forest resources for control of felling and transport of timber	Definition of Conservation Forest, Reserve Forest, Village forests	Forest Department
Irrigation Clauses Act 1973	To provide regulations for the construction of structures across the irrigation canals and water resources.	Regulates the construction of structures across the irrigation canals and water resources.	Department of Irrigation
Land Acquisition (Amendment) Act, Nº 13 of 1986	Establishes the procedure to be followed by the competent authorities for the acquisition	It includes, among other matters: investigations for selecting land to be carried out	Department of Valuation

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
	of land for public purpose.	by a district officer appointed by the Minister; issue of notice of intended acquisition indicating the compensation to be paid for any damage caused during investigations; issue of notice of acquisition of land or servitude for a public purpose.	
Monuments and Archaeological Sites and Remains Act, 1958. Act Nº24 of 1958 Antiques Ordinance, 1960	An Act to provide for the preservation of ancient and historical monuments and archaeological sites and remains of national importance	For the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects etc.	Department of Archaeology
Motor Traffic Act Nº 60 of 1979	To provide sustainable approach for vehicle traffic	Regulates vehicle traffic during transportation of construction materials and the construction activities	
National Environmental Act Nº 47 of 1980, amendment Nº 56 of 1988, and other amendments	Provide protection, management, enhancement of the environment with prevention and control of pollution	Regulates sustainable utilisation of almost all natural resources such as water, soil and air	Central Environmental Authority (CEA)
National Environmental (Protection & Quality) Regulations, No 01 1990.	To provide for the prevention and control of water pollution and enhancing the quality of water	Controls sewage and effluents into inland surface water	CEA
National Environmental (Ambient Air Quality) Regulations, 1994.	To provide for the prevention and control of air pollution	Controls emissions of air pollutants	CEA
National Environmental (Noise Control) Regulations Nº1 1996	To provide maximum allowable noise levels	Regulates noise pollution	CEA
National Involuntary Resettlement Policy	Land Acquisition Act does not deal with the broader social and economic impacts of the project. Thus, this policy was established to overcome these impacts.	To monitor land replacement, income restoration, relocation assistance and allowances, consultation and grievance redress, assistance to vulnerable groups and provision of resettlement sites and services.	Government of Sri Lanka / Land Acquisition and Resettlement Committee (LARC)
Public Utilities Commission of Sri Lanka Act , Nº 35 of 2002	Create an environment for all inhabitants of Sri Lanka and the contributors to its development, to have access to essential infrastructure and utility services in the most economical manner within the boundaries of the sustainable development agenda	Regulate all the utilities within the purview of the Public Utilities Commission of Sri Lanka, to ensure safe, reliable and reasonably priced infrastructure services for existing as well as future consumers in the most equitable and sustainable manner.	The Public Utilities Commission of Sri Lanka
Soil Conservation (Amendment) Act Nº 24 of 1996	Act for conservation of soil resources and productive capacity of land	Degraded Land, prevent damage against salinity, water logging, drought, floods	Soil Conservation Board
Sri Lanka Sustainable Energy Authority Act, Nº 35 of 2007	To develop renewable energy resources; to declare energy development areas;	Reliability and cost effectiveness in energy delivery and information	Sri Lanka Sustainable Energy Authority

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
	to implement energy efficiency measures and conservation programmes; to promote energy security	management, function as a National Technical Service Agency of Clean Development Mechanism (CDM) in Sri Lanka that provides technical assistance to the Designated National Agency for Clean Development Mechanism and project developers, on energy sector clean development project activities	
National Institute of Occupational Safety And Health Act, No. 38 Of 2009	An act to provide for the establishment of the national institute of occupational safety and health for the formulation of a policy on occupational safety and health standards; to create an environment for occupational safety and health at all workplaces to protect both the employers and employees; and for matters connected therewith or incidental thereto	Occupational safety and health standards	National Institute of Occupational Safety and Health

2.2 Assessment of Legal and Institutional Framework

Sri Lankan Environmental Legislation

14. The requirement for Environmental Assessment in Sri Lanka is established by the National Environment Act No. 47 (1980), and the amendment to the act 1988, Act No. 56 Section 23A, for EPL procedure and the EIA regulation under Part 4C, under the provision of section 23Z. The procedures are defined in the environmental impact assessment (EIA) Regulations Gazette No. 772/22 (1993). The Prescribed Projects set out in the Gazette Extra Ordinary No. 772/22 of 24th June 1993, No: 1104/22 dated 6th November 1999, and No: 1108/1 dated 29th November 1999 for which environmental assessment is mandatory, and described as below:

Part I: Projects and undertakings if located wholly or partly outside the coastal zone as defined by Coast Conservation Act No. 57 of 1981.

- Reclamation of Land, wetland area exceeding 4 hectares.
- Extraction of timber covering land area exceeding 5 hectares.
- Conversion of forests covering an area exceeding 1 hectare into non-forest uses.
- Clearing of land areas exceeding 50 hectares.
- Installation of overhead transmission lines of length exceeding 10 kilometers and voltage above 50 Kilovolts.
- All renewable energy based electricity generating stations exceeding 50 Megawatts.
- Involuntary resettlement exceeding 100 families other than resettlement affected under emergency situations.
- Development of all Industrial Estates and Parks exceeding an area of 10 hectares.

PART III: All projects and undertaking listed in Part I above irrespective of their magnitudes and irrespective of whether they are located in the coastal zone or not, if located wholly or partly within the areas specified in part III of the Schedule.

1. Within 100 m from the boundaries of or within any area declared under
   i. the National Heritage Wilderness Act No. 3 of 1988.
   ii. the Forest Ordinance (Chapter 451).
   iii. whether or not such areas are wholly or partly within the Coastal Zone as defined in the Coast Conservation Act, No. 57 of 1981.
2. Within the following areas whether or not the areas are wholly or partly within the Coastal zone:
   i. any erodable area declared under the Soil Conservation Act (Chapter 450).
   ii. any flood area declared under the Flood Protection Ordinance (Chapter 449) and any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act, 15 of 1968 as amended by Act, No. 52 of 1982.
   iii. 60 meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having a width of more than 25 meters at any point of its course.
   iv. any reservation beyond the full supply level of a reservoir.
   v. any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (Chapter 188).
   vi. any area declared under the Botanic Gardens Ordinance (Chapter 446).
   vii. within 100 meters from the boundaries of, or within, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (Chapter 469).
   viii. within 100 meters form the high flood level contour of, or within, a public lake as defined in the Crown Lands Ordinance (Chapter 454) including those declared under section 71 of the said Ordinance.
   ix. Areas declared under the Urban Development Authority Act No 41 of 1978 and Act No. 4 of 1982 section 29 (this indicates in its definition that laws are valid to the areas of the Local authorities).

15. The requirements for EIA and the level of study required are determined by the Central Environment Authority (CEA) after submission by the proponent of a Project Information Document (PID), plus supporting information, if relevant. There are two possible outcomes:

16. **Categorical Exclusion:** The activity is not on the list of prescribed projects in the EIA regulations, is not in or near a sensitive area, has not been the subject of public protest, and it is clear from the PID and supporting information that the project will have no significant environmental impacts. Environmental clearance is granted (with or without conditions) and the project may proceed.

17. **Environmental Assessment:** All other projects require Environmental Assessment and the CEA establishes a Scoping Committee to decide on the level of study (IEE or EIA) and prepare Terms of Reference (ToR). Alternatively, if the project lies wholly within the jurisdiction of a single government agency, only if it is a gazetted PAA agency. CEA may refer the project to this authority (as the Project Approving Agency) to administer the EIA process. A Technical Review Committee (TRC) reviews the completed IEE or EIA report and recommends whether environmental approval shall be granted; the final decision is made by CEA.

18. There are further compliance requirements prescribed by other certain legislation, in particular the Coast Conservation Act, which requires clearance by the Coast Conservation

Department (CCD) for any development activity or structure in the coastal zone[2]. An Environmental Protection License (EPL) from CEA, is required for the operation of the completed facilities (A list has been published by CEA).

19. No development or encroachment of any kind is permitted in archaeological reserves declared under the Antiquities Ordinance No. 9 of 1940 as amended (Section 34). The Director General of Archaeology is empowered to conduct an Archaeological Impact Assessment of areas that may be affected by development or other projects proposed by the government or any person.

20. No construction activities are permitted in national reserves (under the jurisdiction of the Department of Wildlife Conservation - the Fauna and Flora Protection Ordinance No. 2 of 1937, as amended) and forest reserves (under the jurisdiction of the Forest Department – see the Forest Ordinance of 1907 as amended). Sanctuaries, also declared under the Fauna and Flora Protection Ordinance, may include privately held land. Clearance from the Department of Wildlife Conservation is required if construction is proposed in sanctuaries. Construction within 1 mile (1.6 km) radius of a national reserve, sanctuary or buffer zone needs permission from the Department of Wildlife Conservation (see the Fauna and Flora Protection Ordinance No. 2 of 1937, as amended). Any development activity within a fishery reserve[3] requires the permission and approval of the Director of Fisheries and Aquatic Resources (see the Fisheries and Aquatic Resources Act No. 2 of 1996). Any construction taking place in close proximity to a forest reserve must be approved and cleared by the Forest Department.

21. Using paddy land for a purpose other than agricultural cultivation without the written permission of the Commissioner General is a punishable offence under the Agrarian Development Act No. 46 of 2000 (Section 32). In addition to environmental clearance, approval from the local authorities and CEA for site clearance; and consent from all relevant *Pradeshiya Sabhas*, Provincial Councils, and Divisional Secretaries shall be obtained before construction begins.

22. Clearance shall be obtained for the proposed development activities, if the area is declared under the UDA Act or Sri Lanka Land Reclamation and Development Corporation (SLLR and DC) Act.

23. A summary of Government environmental compliance requirements applicable to the project is presented in **Table 4**. **Annexure 1** indicates the applicable System Design Standards used by CEB for setbacks to ensure minimum distances, safety parameter for different voltages etc.

[2] The coastal zone is defined in the Coast Conservation Act No. 57 of 1981 "as the area lying within a limit of 300 meters landward from mean high water line (MHWL). In the case of rivers, streams, lagoons or any other body of water connected to the sea, either permanently or periodically, the landward boundary extends to a limit of 2 km measured perpendicular to the straight base line drawn between the natural entrance points thereof and includes waters of such rivers, streams and lagoons or any other body of water so connected to the sea."

[3] Certain areas adjoining earmarked reservoirs and water bodies can be declared as a fishery reserve with the concurrence of the Ministry of Wildlife and Natural Resources.

Table 4: Summary of Environmental Compliance Requirements of the Project Components for EARF Consideration

	Subproject	Subcomponent	Applicable Legislation	Statutory Requirement	Authorizing Body
1.	New Transmission lines, Distribution lines, substations	All subcomponents in sensitive areas	National Environment Act (NEA)	Environmental Clearance (EC)	Central Environment Authority (CEA)
		All subcomponents falling within the coastal zone	Coast Conservation Act	Clearance	Coastal Conservation Department (CCD)
		All subcomponents that require site clearance	Municipal Councils Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the *Pradeshiya Sabha* Act No. 15 of 1987 as amended	Clearance	Municipal Councils, Urban Councils and *Pradeshiya Sabhas*
		All subcomponents that require cutting of trees	Felling of Trees (Control) Act No 9 of 1951	Tree-cutting Permit	Forest Department
		All subcomponents within a 1 mile (1.6 km) radius of a national reserve, sanctuary, or buffer zone	Fauna and Flora Protection Ordinance No. 2 of 1937 as amended	Clearance	Department of Wildlife Conservation
		All subcomponents in close proximity of a reserve forest	Forests Ordinance No. 16 of 1907 as amended	Clearance	Forest Department
		All subcomponents in and around fishery reserves	Fisheries and Aquatic Resources Act No. 2 of 1996	Clearance	Director of Fisheries and Aquatic Resources
		All subcomponent in proximity of archaeological reserves	Antiquities Ordinance No. 9 of 1940 as amended	Clearance	Department of Archaeology
		All subcomponent in and around irrigation development	Irrigation Development Act	Clearance	Director, Irrigation Department
		All subcomponent in and archaeological reserves around UDA declared areas	UDA Act No. 41 1978 and No. 4 of 1982	Clearance	Regional Director UDA
2	Solar Park, Wind Farm	All subcomponents in sensitive areas	NEA	EC	CEA
		All subcomponents falling within the coastal zone	Coast Conservation Act	Clearance	CCD

	Subproject	Subcomponent	Applicable Legislation	Statutory Requirement	Authorizing Body
		All subcomponents that require site clearance	Municipal Councils Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the *Pradeshiya Sabha* Act No. 15 of 1987 as amended	Clearance	Municipal Councils, Urban Councils and *Pradeshiya Sabhas*
		All subcomponents that require cutting of trees	Felling of Trees (Control) Act No. 9 of 1951	Tree-cutting Permit	Forest Department
		All subcomponents within a 1 mile (1.6 km) radius of a national reserve, sanctuary, or buffer zone	Fauna and Flora Protection Ordinance No. 2 of 1937 as amended	Clearance	Department of Wildlife Conservation
		All subcomponents in close proximity of a reserve forest	Forests Ordinance No. 16 of 1907 as amended	Clearance	Forest Department
		All subcomponents in and around fishery reserves	Fisheries and Aquatic Resources Act No. 2 of 1996	Clearance	Director of Fisheries and Aquatic Resources
		All subcomponent in proximity of archaeological reserves	Antiquities Ordinance No. 9 of 1940 as amended	Clearance	Department of Archaeology
		All subcomponents in and around fishery reserves	Fisheries and Aquatic Resources Act No. 2 of 1996	Clearance	Director of Fisheries and Aquatic Resources
		All subcomponent in proximity of archaeological reserves	Antiquities Ordinance No. 9 of 1940 as amended	Clearance	Department of Archaeology

CCD= Coastal Conservation Department, CEA = Central Environment Authority, EC = Environmental Clearance, NEA = National Environment Act, UDA = Urban Development Authority.

24. **Table 5** summarizes the application procedures for the main environmental permits.

Table 5: Summary of Procedure for Obtaining Environmental Permits Required by Government of Sri Lanka

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
1. Central Environmental Authority - Environment Impact Assessment/Initial Environmental Examination (IEE/EIA) Clearance			

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
National Environmental Act No. 47 of 1980 and amended Act No. 56 of 1988; Government Gazette No. 772/22 of 24th June 1993 and No. 859/14 of 23rd February 1995	Central Environmental Authority (CEA)	1. Proponent to submit Project Information Document to CEA	During Feasibility Stage
		2. CEA to designate Project Approving Authority (PAA)	36 days
		3. PAA to appoint scoping committee; Issue of Terms of Reference (ToR) for the EIA/IEE	
		4. Proponent to conduct the environmental assessment and submit report to PAA	One and half years
		5. PAA to check adequacy	14 days
		6. For EIA, report will be open for public comments	30 days
		7. Technical Review Committee (TRC) to review report and forwarding comments	36 days
		8. PAA to recommend to CEA issuance of Clearance	
2. Coast Conservation Department Permit			
Under Section 5, 14, 15 and 16 of Coast Conservation Act No. 57 of 1981	Coast Conservation Department (CCD)	1. Proponent to submit application to CCD	During Feasibility Stage
		2. CCD to issue ToR for EIA/IEE	About 14 days
		3. Proponent to conduct the environmental assessment and submit report to CCD	One and half years
		4. For EIA, CCD will (i) invite Coast Conservation Advisory Council for comments; and (ii) open report for public comments	120 days (maximum)
		5. CCD to review comments	
		6. CCD to issue permit	
3. Environmental Protection License (EPL)			
National Environmental Act No. 47 of 1980 amended by Acts No. 56 of 1988 and No. 53 of 2000; Gazette Notification No. 1533/16 dated 25.01.2008	CEA	1. Proponent to submit application to CEA	Minimum of 30 days prior to the commencement of operation
		2. CEA to conduct field inspection and verification from relevant authorities	14 days
		CEA to prepare Inspection Report with Recommendations	14 days
		TRC to review report	
		Proponent to pay license fee	
		CEA to issue EPL	
4. Archaeological Impact Assessment Survey			
Under Section 47 read with Section 43(b) of Antiquities	Department of Archaeology	Proponent to submit application to Department of Archaeology.	During Feasibility

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
(Amendment) Act No. 24 of 1998; Gazette Notification No. 1152/14 dated 04.10.2000		DA Regional Office to conduct Preliminary Observation and submit report to Department of Archaeology.	Stage About 30 days
		(i) If there are no antiquities according to the recommendation and observation report, land will be released for the project.	
		(ii) If the preliminary observation report has proposed to carry out an archaeological impact assessment survey, steps will be taken to conduct the survey including scoping with other agencies.	30 days
		Department of Archaeology to call for quotations and award contract for Archaeological Impact Assessment (AIA) survey	
		Selected agency to conduct AIA survey and submit report to Department of Archaeology	42 days
		Department off Archaeology to submit AIA report to Minister in charge of approval	About 30 days
		Department of Archaeology to issue approval	
5. Clearance from Department of Forest Conservation			
Under the ordinance enacted in 1907 No. 16, and subsequent amendment No. 23, 1995 and No. 65 of 2009.	Department of Forest Conservation (DFC)	Proponent to submit application to DFC	During Feasibility Stage
		District Forest Office along with the DFC officials to conduct preliminary observation and submit report to Conservator General of DFC for approval	About 60 days
		(i) If the project is located within the core protected area, the application will be rejected;	60 days
		If the project will utilize resources from the forest (timber or related) the application will be rejected (even if it is located outside the boundary and the buffer);	
		If the project is outside the boundaries and buffers of any Forest Reserves (FRs), DFC's consent will be released.	
		DFC will refer to CEA if the proposed	30 days

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
		activities will cause negative impacts on forest conservation areas and there will be extraction of resources involved.	
		- Under NEA, EIA will be conducted - DFC will become the project approving agency	116 days
		DFC will release the approval with the concurrence of the CEA.	

Notes: CEA = Central Environmental Authority, PAA = Project Approving Agency, CCD = Coast Conservation Department, ToR =Terms of Reference, EPL = Environment Protection License, EIA = Environmental Impact Assessment, IEE = Initial Environmental Examination, DA =Department of Archaeology, AIA = Archaeological Impact Assessment, UDA= Urban Development Authority, SLLR&DC = Sri Lanka Land Reclamation and Development Corporation, DFC = Department of Forest Conservation.

2.3 Applicable International Environmental Agreements

25. In addition to national laws and regulations, international conventions such as the International Union for Conservation of Nature and Natural Resources (IUCN), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species of Wild Animals (CMS) and Ramsar Convention on Wetlands of International Importance etc. are applicable for selection and screening of subprojects under restricted/sensitive areas. Sri Lanka is a party to these conventions.

26. **International Union for Conservation of Nature and Natural Resources (IUCN).** The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1963, is a comprehensive inventory of the global conservation status of plant and animal species. The IUCN is an authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction.

27. **Convention on Migratory Species of Wild Animals (CMS). CMS was adopted in 1979 and** entered into force on 1 November 1983. CMS, also known as the Bonn Convention, recognizes that local authorities must be the protectors of migratory species that live within or pass through their national jurisdictions, and aim to conserve terrestrial, marine, and avian migratory species throughout their ranges. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II of the Convention, and CMS encourages the range states to conclude global or regional agreements.

28. **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).** It is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES was first formed, in the 1960s. Annually, international wildlife trade is estimated to be

worth billions of dollars and includes millions of plant and animal specimens. The trade is diverse, ranging from live animals and plants to a vast array of wildlife products derived from them, including food products, exotic leather goods, wooden musical instruments, timber, tourist curios and medicines. Levels of exploitation of some animal and plant species are high and the trade in them, together with other factors, such as habitat loss, is capable of heavily depleting their populations and even bringing some species close to extinction. Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important in order to safeguard these resources for the future. Because the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation.

29. **Ramsar Convention on Wetlands of International Importance 1971.** The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. According to the Ramsar list of Wetlands of International Importance, there are five designated wetlands in Sri Lanka that need to be protected. Activities undertaken in the proximity of Ramsar wetlands shall follow the guidelines of the convention. Sri Lanka presently has 5 sites designated as Wetlands of International Importance, with a surface area of 32,372 hectares.

30. **United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention.** The most significant feature of the 1972 World Heritage Convention is that it links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two. The convention defines the kind of natural or cultural sites, which can be considered for inscription on the World Heritage List. The convention sets out the duties of states parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage. The states parties are encouraged to integrate the protection of the cultural and natural heritage into regional planning programs, set up staff and services at their sites, undertake scientific and technical conservation research, and adopt measures, which give this heritage a function in the day-to-day life of the community. It also encourages states parties to strengthen the appreciation of the public for World Heritage properties and to enhance their protection through educational and information programs.

2.4 Asian Development Bank's Safeguards Policies

31. Safeguard Policy Statement 2009 of ADB and procedures and guidelines as listed in **Annexure 1** thereto apply to all components/subprojects funded by ADB.

32. The Environment Assessment and Review Framework (EARF) guidelines applicable to this Tranche for project selection are also summarized in the Annexure.

2.5 Other documents relevant to ADB's Safeguard Policy Statement, 2009

33. World Bank Group's Environment, Health and Safety (EHS) Guidelines, 2007 (currently under revision).

- Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution.

34. ADB's Environmental Safeguards: A Good Practice Sourcebook-Draft Working Document (November 2012).

35. ILO Core Labor Standards.

3.0 DESCRIPTION OF THE PROJECT

3.1 The Project

36. The Transmission Infrastructure Enhancement of the Green Power Development and Energy Efficiency Improvement Investment Tranche 2 Program include:

T-1	New Polpitiya-Hambantota 220 kV Transmission Development
T-2	Construction of Colombo B & C 132/11 kV Grid Substation
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations
T-4	Padukka – Horana 132 kV Transmission Development
T-5	Construction of Biyagama 220/33 kV Grid Substation
T-6	Augmentation of Dehiwala Grid Substation
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line
T-8	Augmentation of Madampe 132/33 kV Grid substation

Transmission Infrastructure Enhancement

T1. New Polpitiya-Hambantota 220 kV Transmission Development

37. The new Polpitiya-Hambantota 220 kV Transmission Development includes the construction of the new Hambantota 220/132/33 kV Switching Station and the new 144 km Polpitiya-Hambantota 2xZebra, 220 kV double circuit transmission line. The Hambantota 220/132/33 kV Switching Station includes 2x250MVA, 220/132/33 kV transformers, 220 kV double bus bar arrangement including bus coupler, 2x220 kV double busbar transformer bays, 2x220 kV double busbar transmission line bays, extension to existing 132 kV double busbar, 2x132 kV double bus bar transformer bays and 2x132 kV double bus bar transmission line bays, and provision for 2x220 kV transmission line bays and 2x132 kV transmission line bays. The objective of this subproject is to improve power supply reliability in Southern Province, economic operation of transmission network and provide future generation interconnections.

T2. Construction of Colombo B &C 132/11 kV Grid Substation

38. Construction of Colombo B Grid Substation will include 2x31.5 MVA 132/11 kV transformers, 132 kV bus bar arrangement including bus section (GIS), 2x132 kV single bus bar cable bays (GIS), 2x132 kV single bus bar transformer bays (GIS), 11 kV single bus bar arrangement including two bus sections (GIS), 2x11 kV transformer bays (GIS), 12x11 kV feeder bays (GIS) and 2x11 kV (10Mvar) capacitor bank bays, and provision for 4x5 Mvar capacitor banks. The subproject also includes single in-and-out connection to Colombo B GSS from Colombo C GSS - Kolonnawa GSS 132 kV underground cable and augmentation of Colombo C and Kolonnawa GSS (Installation of 132 kV protection & control panel for line bay). The objective of the project is to cater to the growing demand for electricity in the area served by Colombo B GS.

T3. Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations

39. This subproject will include construction of Biyagama 33 kV GIS system (2x33 kV Transformer bays, 10x33 kV feeder bays, 1x33 kV Bus section bays including Bus bar, extend of Substation Automation System) and construction of new control building; replacement of 132 kV circuit breakers, Isolators, Capacitor Voltage Transformers, Current Transformers, Lightning

Arresters, Bay connectors and clamps, modification of 132 kV protection & control panels for line bay, transformer bay and bus coupler bay, 220V and 48V Battery system, Automatic Voltage Regulator for transformer and extend of Substation Automation System at Kotugoda Grid Substation; construction of Kolonnawa – Old 33 kV GIS system (2x33 kV GIS transformer bays, 10 x33 kV GIS feeder bays, 1x33 kV GIS Bus section bays including Bus bar, 2x200 kVA Earthing Transformer and Construction of new control building). The objective is to provide reliable and quality electricity supply to the areas fed by Biyagama, Kotugoda and Kolonnawa.

T4. Padukka – Horana 132 kV Transmission Development

40. The Padukka – Horana 132 kV Transmission Development will include construction of 23.7 km Padukka-Horana, Zebra, 132 kV double circuit transmission line, 2x132 kV double bus bar transmission line bays at Padukka Switching Station, and 2x132 kV single bus bar transmission line bays at Horana Grid Substation. The objectives of the development are to improve the reliability of Southern Network and the economic operation of transmission network. Padukka substation was funded in previous phases of ADB funded projects.

T5. Construction of Biyagama 220/33 kV Grid Substation

41. The construction of Biyagama 220/33 kV Grid Substation will include 2x63MVA 220/33 kV transformer, 2x220 kV double bus transformer bays, 2x33 kV transformer bays, 4x33 kV feeder bays, 2x33 kV single bus arrangement including bus section. The objective of the subproject is to develop the transmission infrastructure to cater to the growing electricity demand in Biyagama area.

T6. Augmentation of Dehiwala Grid Substation

42. The augmentation of Dehiwala Grid Substation (2x 31.5 MVA to 3x31.5 MVA) will include the installation of 31.5 MVA transformer, and the construction of 1x132 kV Single Bus Indoor Transformer bay, 1x 33 kV Transformer bay, 4x33 kV feeder bays and 1x33 kV bus section bay.

T7. Second Circuit Stringing of Habarana–Valachchenai 132 kV Transmission Line

43. This subproject will include the construction of the Second Circuit of the 100km Habarana - Valachchenai Zebra, 132 kV Transmission Line. The objective is to improve the quality and reliability of the electricity supply in Eastern and North Central provinces.

T8. Augmentation of Madampe Grid Substation

44. The augmentation of Madampe Grid Substation (2x 31.5 MVA to 3x31.5 MVA) will include the installation of a 132/33 kV, 31.5 MVA transformer, construction of 1x132 kV Single Bus bar Transformer bay, 1x33 kV GIS Transformer bay, one 33 kV GIS bus section bay including bus bar, 4x33 kV GIS feeder bays and Substation Automation System.

3.2 Type of Project

45. The project implementation will lead to development of transmission projects, which involve evacuation of power from clean energy sources (wind, solar, small hydro) and overall network efficiency improvement. CEB's transmission planning wing has identified a list of projects, based on the Long term Transmission Development Plan 2011-2032 and Long Term

Generation Development Plan 2013-2032, which are critical for the overall development of the power system. Considering the requirements of Sri Lanka's power system for medium to long term, the prioritization of projects for the proposed loan has been undertaken based on following principles for sequence of preference criteria for transmission projects:

- Transmission projects associated with evacuation of clean energy, specifically from the wind and solar projects/ proposed parks have been given the highest preference
- Augmentation of transmission capacities associated with renewable park evacuation projects
- Transmission projects required for network efficiency improvement – loss reduction, etc.

3.3 Justification of the Project

46. Due to the fast emerging energy demand from the area, there is a distinct necessity for strengthening and expanding the transmission network in the northern, southern and western region. Under the adopted standards, the forecast loading of each GSS is compared with the firm capacity and the necessary transformer augmentations as well as construction of new substations. It is a standard adopted by CEB that, loading of each transformer should not exceed 120% of its capacity under single transformer outage conditions.

47. The key objective of the project is to improve the reliability of the transmission system and cater to the growing demand in the region. The justification for all subprojects is given as follows:

T-1 New Polpitiya - Hambantota 220 kV Transmission Development

48. The Southern Province demonstrates visibly the Sri Lankan government's efforts to develop regional economies. The new port and new airport in Hambantota offer significant opportunities in diverse business areas, including cargo and shipping, tourism and the service sector. No major power plant developments have been identified in Southern Province until year 2024 and therefore it is difficult to provide quality and reliable power supply from existing 132 kV network. Further, when the Samanalaweva power station is not in operation, the system reliability in southern province area is not guaranteed under contingency situation. To mitigate the above issue, Long Term Transmission Development Plan 2013-2022 has identified 220 kV transmission connection to Hambantota from Kothmale via New Polpitiya. This will operate as a transmission high way to flow hydro power generated at Mahaweli complex and Laxapana complex to southern load center and hence facilitate to provide quality and reliable power supply to Southern Province. New Polpitiya-Hambantota 220 kV transmission line is a part of this development. According to the year 2017 transmission network, over loading of Pannipitiya-Panadura 132 kV transmission line and severe voltage drops at Embilipitiya, Hambantota, Matara, Beliatta, Galle, Deniyaya grid substations can be observed without the proposed New Polpitiya-Hambantota 220 kV transmission line. So the proposed line is at the highest priority to improve the reliability and voltage profile of the Southern network. With the proposed New Polpitiya-Hambantota 220 kV connection, 220 kV backbone network will be expanded to the Southern province. Hence it reduces the loading of existing 132 kV lines and reduces the losses of the transmission network.

T-2 Construction of Colombo B &C 132/11 kV Grid Substation

49. At present Colombo B is a 33/11 kV substation, which feeds Colombo 11 region. The main Harbor of the country and many other commercial centers are located in this region. According to the statistical data the anticipated load growth rate of the area is 5.1%. Following

major loads to be added in the near future and the existing Colombo B Substation cannot cater for the expected demand increase in the area a). 4 MVA for CWE Co-operative & Internal Trade project at Sri Sangaraja Mawatha; b). 7.2 MVA for Colombo Land Project at Boodhiraja Mawatha; and c). 3 MVA for Tripoly market at Maradana. In addition, part of the loads connected to Colombo F GSS needs to be transferred to Colombo B GSS in order to avoid overloading in future. Further, there are only two 33 kV feeders available at Colombo B GSS at present and these feeders are about 50 years old and frequent failures occurr in the cables. The 132 kV power cables required for the proposed substation will be laid under the Colombo City Electricity Distribution Development Project, hence only the upgrading of substation is required. By considering the above facts it is proposed to upgrade the Colombo B substation from 33/11 kV to 132/11 kV and ensure the reliability of the supply.

T-3 Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations

50. **Augmentation of Biyagama Grid Substation:** 2x250MVA/60MVA, 220/132/33 kV Biyagama Grid Substation was commissioned in 1984 and out of eight 33 kV existing feeder bays, four feeders were commissioned at the beginning and remaining four feeders were added during 1995. It feeds many industries including Biyagama Free Trade Zone in Biyagama area. The existing Circuit breakers, current transformers and all other equipment including protection and control equipment in 33 kV side which were installed at initial stage is more than 27 years old and items installed in second stage is more than 17 years old. Therefore, the reliability of the 33 kV switchyard is low for domestic as well as industrial customers specially free trade zone feeding from Biyagama GSS. Further, due to aging and unavailability of adequate space of the control building, it is required to construct a new control building at Biyagama Grid Substation. Therefore, it is proposed to augment the Biyagama Grid Substation by construction of 33 kV Gas Insulated Substation, considering the age, the reliability and availability of limited space in the Biyagama Grid Substation.

Augmentation of Kotugoda Grid Substation

51. 2x250MVA/60MVA, 220/132/33 kV Kotugoda Grid Substation was commissioned in 1983 and it feeds many important government and commercial establishments in Seeduwa, Ekala and Gampaha areas. It is reported that all 132 kV switchgears except new two transformer bays have operational problems. Therefore, it is proposed to augment Kotugoda Grid Substation in order to improve the quality and reliability of the electricity supply in Kotugoda area.

Augmentation of Kolonnawa – Old Grid Substation

52. Kolonnawa – Old Grid Substation feeds Ceylon Petroleum Corporation in Kolonnawa area as well as many important government and commercial establishments in Kalubowila and Weliwita areas. 33 kV side of the Kolonnawa – Old Grid Substation is outdoor type while 132 kV side is Gas Insulated Substation. All equipment of 33 kV bays, protection and control panels of 33 kV bays need to be replaced due to aging and operational problems. Therefore, it is proposed to augment the Kolonnawa Old Grid Substations by construction of 33 kV GIS system Substation in order to improve the quality and reliability of the electricity supply in Kalubowila and Weliwita areas.

T-4 Padukka – Horana 132 kV Transmission Development

53. Present Southern Transmission network is mainly fed through New Laxapana-

Balangoda, Pannipitiya-Panadura and Samanalawewa-Embilipitiya 132 kV Transmission lines. An outage in one of the circuits of Pannipitiya-Panadura transmission line or New Laxapana-Balangoda transmission line may cause tripping of other circuit also. This may cause low voltages in the southern network as well. The proposed Padukka-Horana 132 kV transmission line will provide an additional path of power flow to the Southern Transmission Network and will improve the reliability of Southern Network. With the proposed Padukka-Horana 132 kV, loading of existing 132 kV lines is reduced and it reduces the losses of the transmission network.

T-5 Construction of Biyagama 220/33 kV Grid Substation

54. According to the demand forecast given in Long Term Transmission Development Plan 2015-2024, the existing 220/33 kV transformer capacity of Biyagama interbus transformer is not adequate to cater the growing demand of Biyagama area, which has a larger BOI Zone. According to the transmission system studies carried out for the year 2018, 220/33 kV winding of the interbus transformer overloads 8% of the contingency rating during night peak loading conditions. Thus, it is important to construct a new 220/33 kV GSS at existing Biyagama switching station premises to cater to the growing electricity demand in Biyagama area.

T-6 Augmentation of Dehiwala Grid Substation

55. Dehiwala grid substation is situated in Western Province of the country. The annual energy demand of the grid substation is around 215.8 GWh and the estimated load growth at present is 4.2%. At present Dehiwala grid substation feeds around 45,000 ordinary consumers and 130 bulk consumers in Kalubowila, Dehiwala, Boralasgamuwa and Attidiya areas. Presently this substation is a 2x31.5MVA grid substation with 8x33 kV distribution feeders. The System Control Center's monthly review report for March 2016 indicates 26 MVA loading of each transformer unit at Dehiwala Grid Substation. This is about 82% loading of the total transformer capacity. In the absence of single unit out of two transformers, the remaining transformer will be unable to cater to the total load requirement and will give rise to technical failures and hence economic losses. Therefore, the addition of third transformer with 31.5MVA capacity is indispensable under these circumstances. By considering the above factors, it is proposed to augment Dehiwala grid substation with one 31.5 MVA transformers and four 33 kV feeders by the year 2021.

T-7 Second Circuit Stringing of Habarana – Valachchenai 132 kV Transmission Line

56. At present Valachchenai 61.5 MVA 132/33 kV grid substation is connected to the national grid by two single circuit 132 kV transmission lines from Habarana grid substation. One transmission line is of Lynx conductor and built in 1995 and this line can transfer only 88 MVA. The new transmission line is a Zebra conductor line and is commissioned in 2014 and it can handle up to 145 MVA. The new line is a double circuit transmission line with only one circuit strung and it connects the Polonnaruwa 63 MVA grid substation. By 2018, Valachchenai grid substation will handle a capacity of 63 MVA. In case of a tripping of Habarana-Polonnaruwa section of the new transmission line, the total grid capacity will flow through the old single circuit transmission line, which will cause to overload and trip the line. In such a case both Polonnaruwa and Valachchenai grid substations will be isolated from the system. This leads to supply failure of 20% of North Central province and 17% of Eastern province load. To avoid such a situation and to improve the quality and reliability of the electricity supply in Eastern and North Central provinces it is proposed to string the second circuit of the 132 kV zebra transmission line from Habarana grid substation to Valachchenai grid substation.

T-8 Augmentation of Madampe 132/33 kV Grid substation

57. By considering the present 33 kV distribution systems, Madampe Grid Substation mainly feeds to Madampe, Bingiriya, Chilaw, Kuliyapitiya and Naththandiya areas. According to past data, Madampe Grid Substation has exceeded its firm capacity and Grid substations should be able to cater to the demand under outage of one unit, without exceeding 120% loading on the existing units.

3.4 Location

58. The proposed sub-projects are located in different area of the country including Western, North Central, and Central provinces. **Table 6** indicates details of the proposed sub-project locations:

Table 6: Different locations of proposed subprojects.

SNo.	Sub-project Component	DS division	District	Province
T-1	New Polpitiya-Hambantota 220 kV Transmission Development - 144 km long line	Ambagamuwa Korale Deraniyagala, Ratnapura Pelmadulla, Godakawela Kolonna, Embilipitiya Tanamalwila, Sooriyawewa Hambantota	Nuwara Eliya, Kegalle, Ratnapura, Monaragala, Hambantota	Central, Sabaragamuwa, Uva, Southern
T-2	Construction of Colombo B 132/11 kV Grid Substation	Colombo	Colombo	Western
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations	Makola Ja Ela Kolonnawa	Gampaha Gampaha Colombo	Western
T-4	Padukka – Horana 132 kV Transmission Development 23.7 km long line	Hanwella, Horana	Colombo, Kalutara	Western
T-5	Construction of Biyagama 220/33 kV Grid Substation	Biyagama	Gampaha	Western
T-6	Augmentation of Dehiwala Grid Substation	Dehiwala, Mt. Lavinia	Colombo	Western
T-7	Second Circuit Stringing of Habarana – Valachchenai 132 kV Transmission Line 100 km	Hingurakgoda, Lankapura Dimbulagala Koralepattu Koralepattu West Eravurpattu	Polonnaruwa, Batticaloa	North-Central, Eastern
T-8	Augmentation of Madampe 132/33 kV Grid substation	Madampe	Puttlam	North Western

59. The list of all figures is given below in **Table 7** below:

Table 7: List of figures for Tranche 2

TRANCHE 2 SUB-PROJECTS		Figure 1
T-1	New Polpitiya-Hambantota 220 kV Transmission Development	Figure 2A and B
T-2	Construction of Colombo B &C 132/11 kV Grid Substation	Figure 3
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations	Figure 4, Figure 5, Figure 6
T-4	Padukka – Horana 132 kV Transmission Development	Figure 7A and B
T-5	Construction of Biyagama 220/33 kV Grid Substation	Figure 4
T-6	Augmentation of Dehiwala Grid Substation	Figure 8
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line	Figure 9 A and B
T-8	Augmentation of Madampe 132/33 kV Grid substation	Figure 10

60. The proposed 220/33 kV Hambantota GSS will be built on government land (owned by Mahaweli Authority as per the Greater Hambantota Development Plan - 2030) 220/33 kV Biyagama, 132/33 kV old Biyagama, Kotugoda and Kolonnawa Old Grid Substations GSS's, 32/11 kV Colombo B &C GSS, 132/33 kV Madampe GSS, substation lands belong to CEB/government and acquisition of land will not be required from the surrounding communities. The Polipitya GSS, Habrana GSS and Padukka GSS were funded under previous ADB projects. For these substation lands, **Table 32** gives the total number of trees to be felled. Crop damage will be evaluated during detailed survey to be conducted by the Engineering, Procurement and Construction (EPC) contractor. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the right of way (RoW) of the transmission lines as can be seen in **Table 36**.

Figure 1: Transmission Map of Sri Lanka including location details of Proposed Tranche 2 Projects

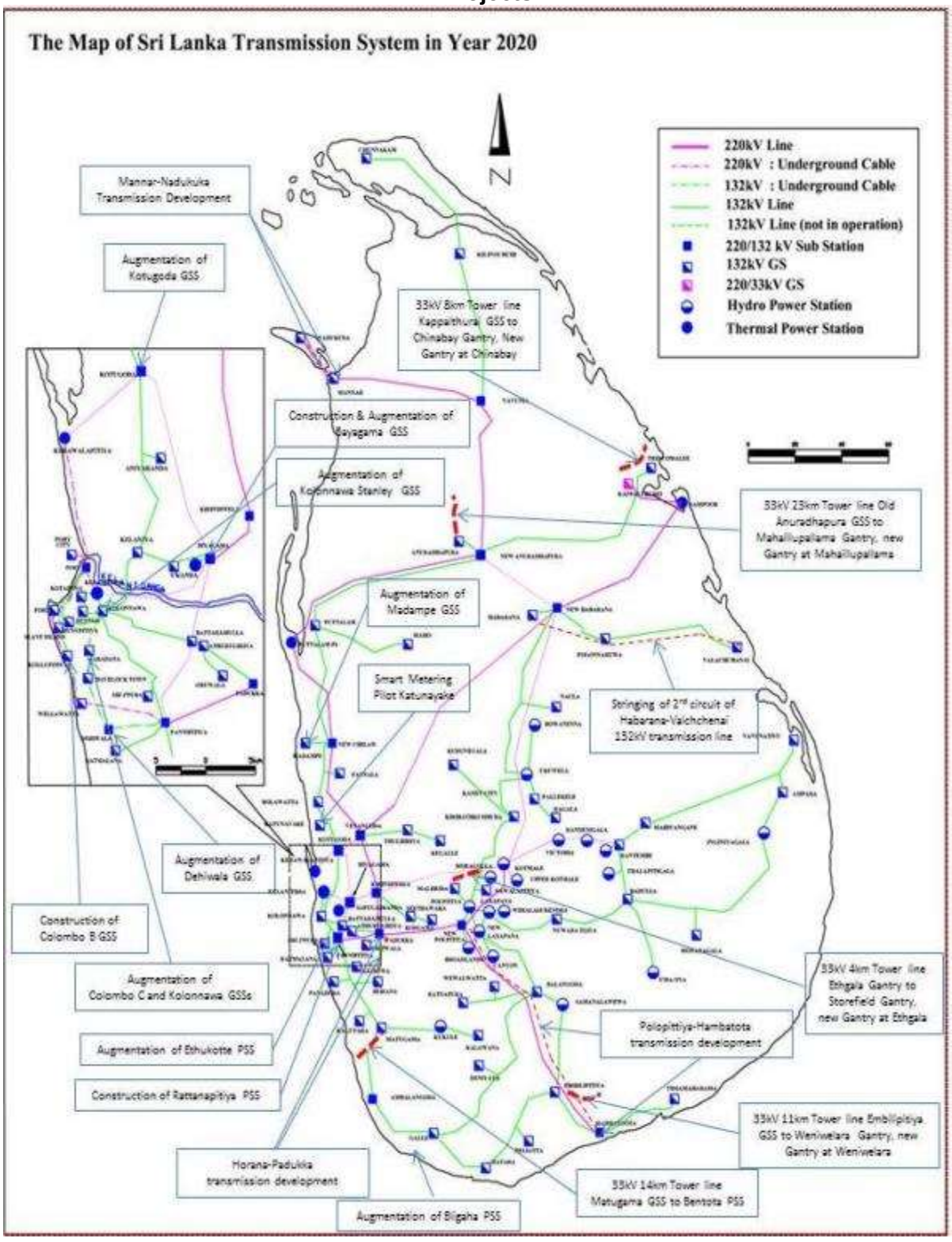
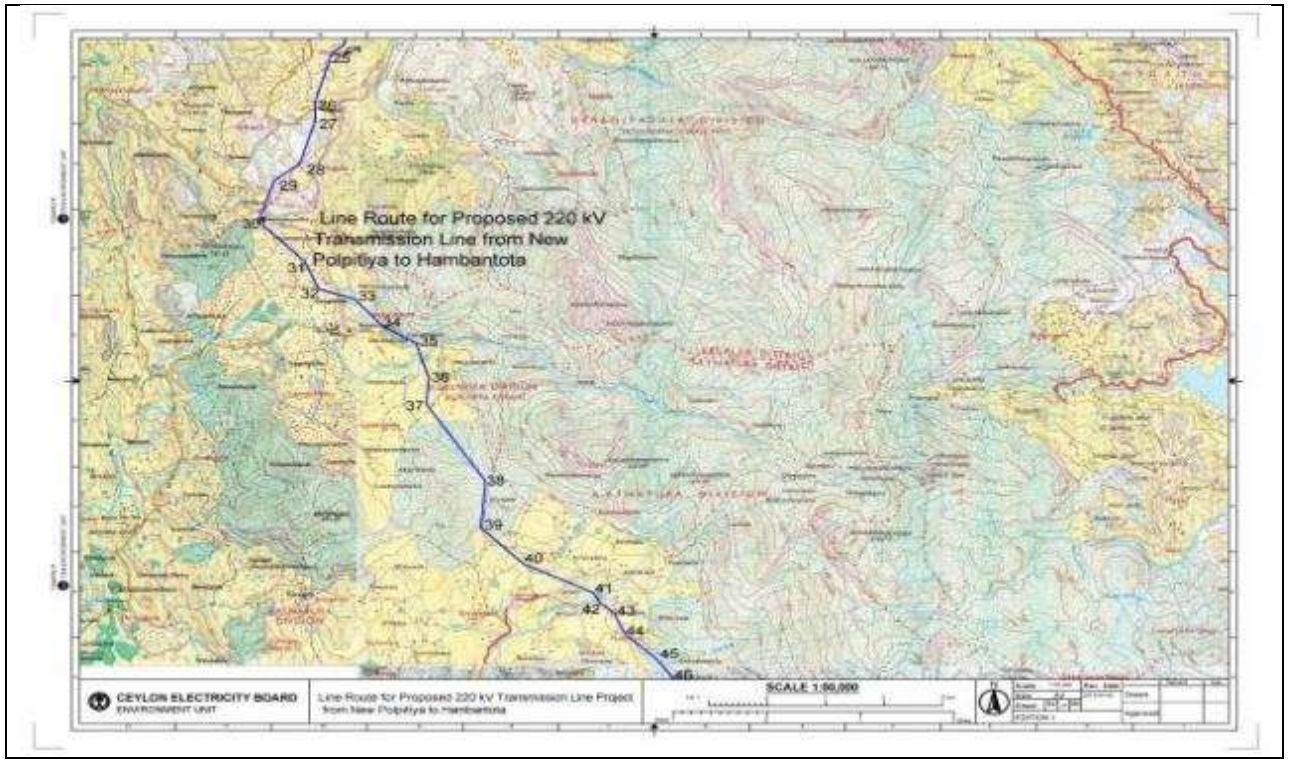
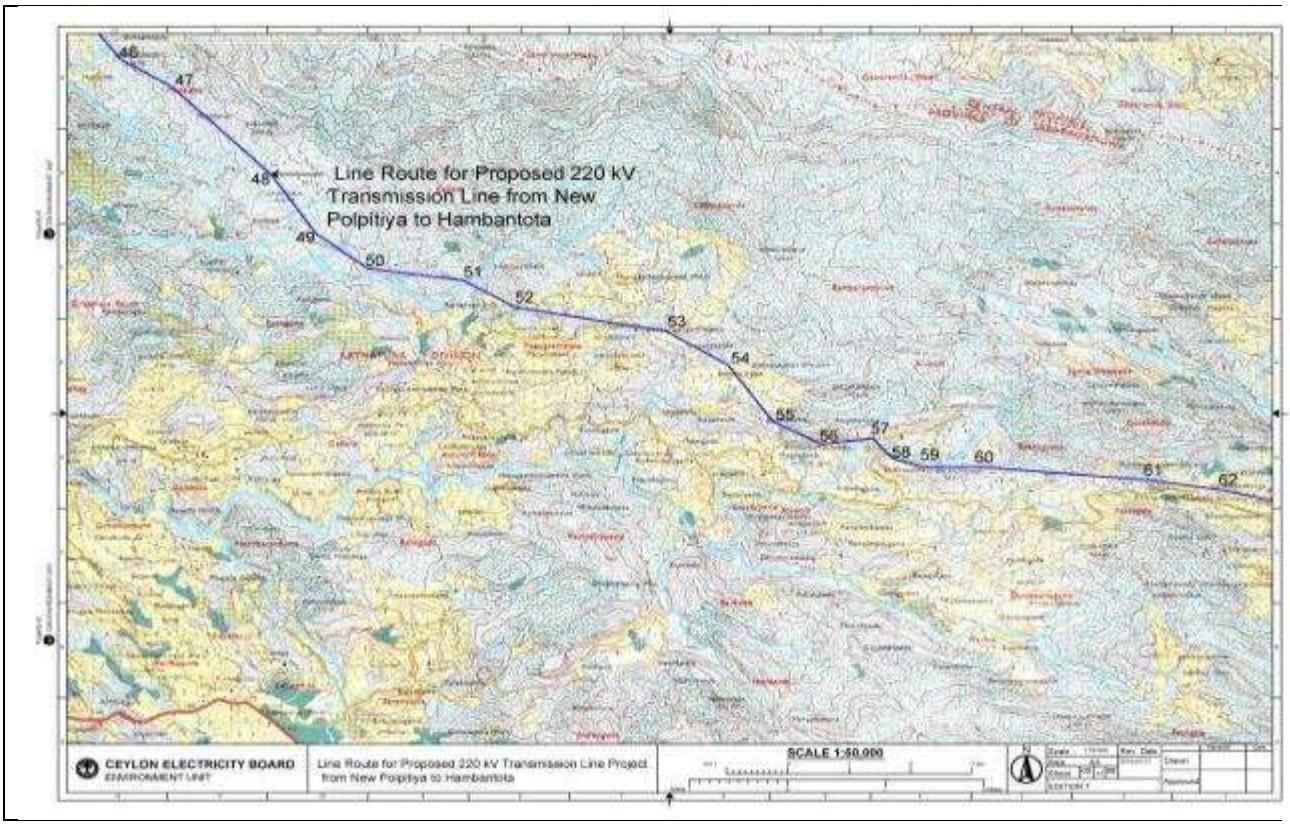
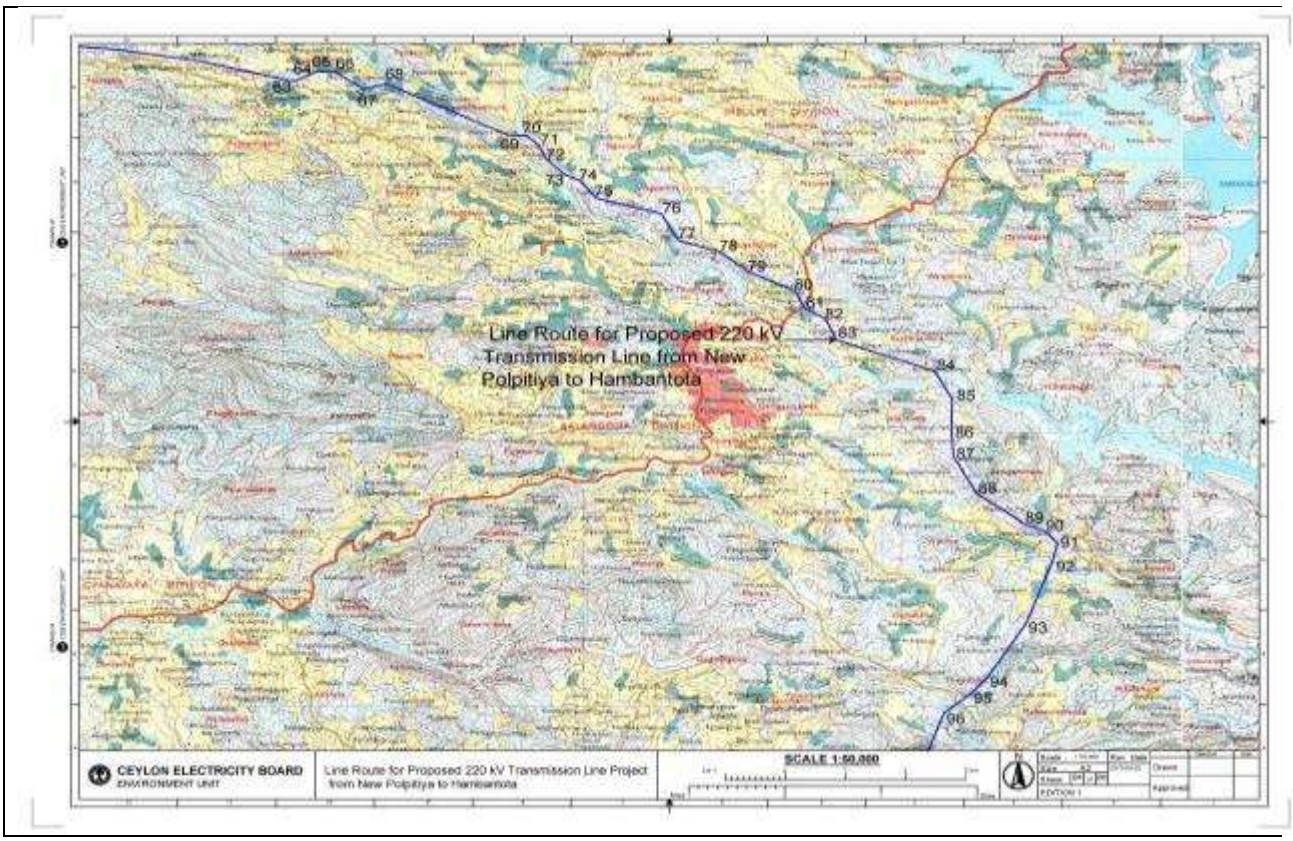
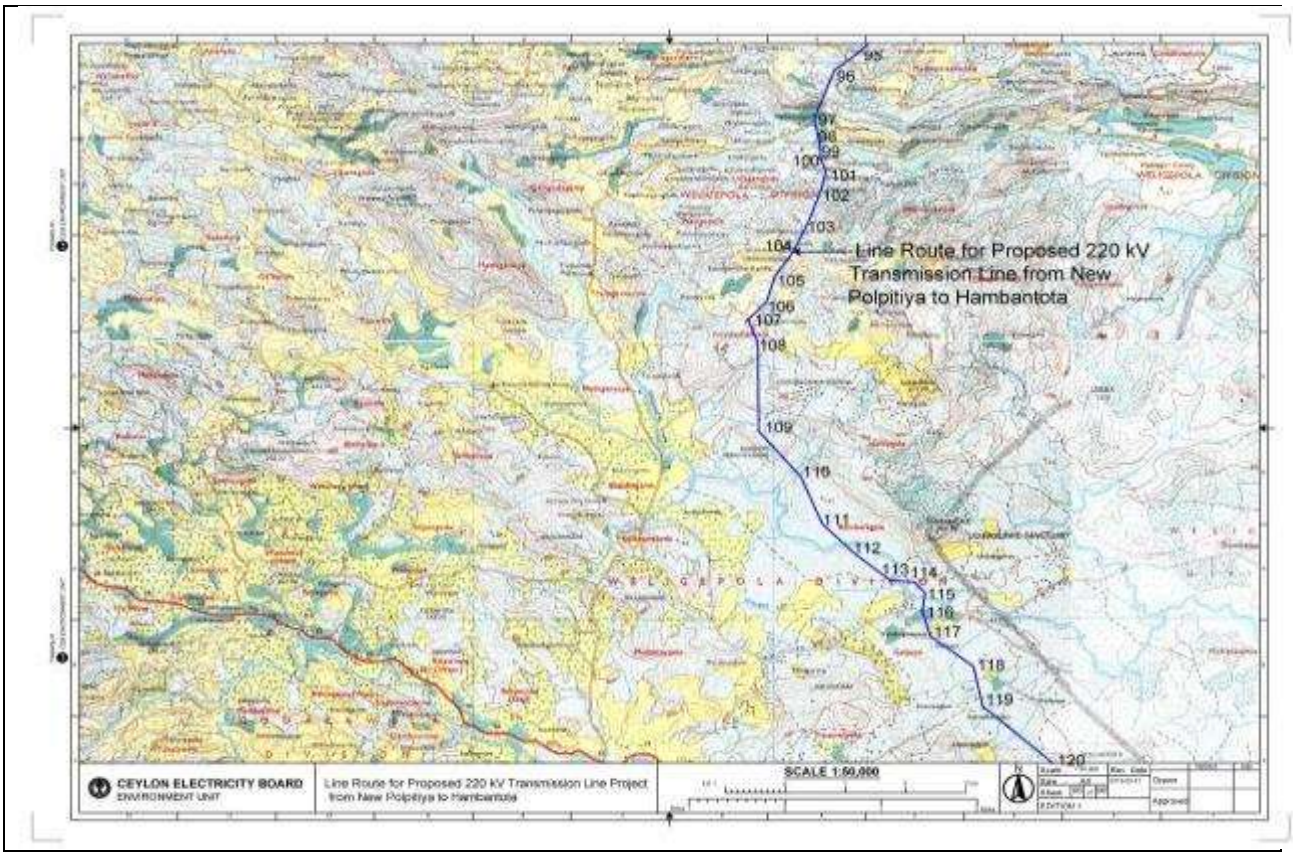


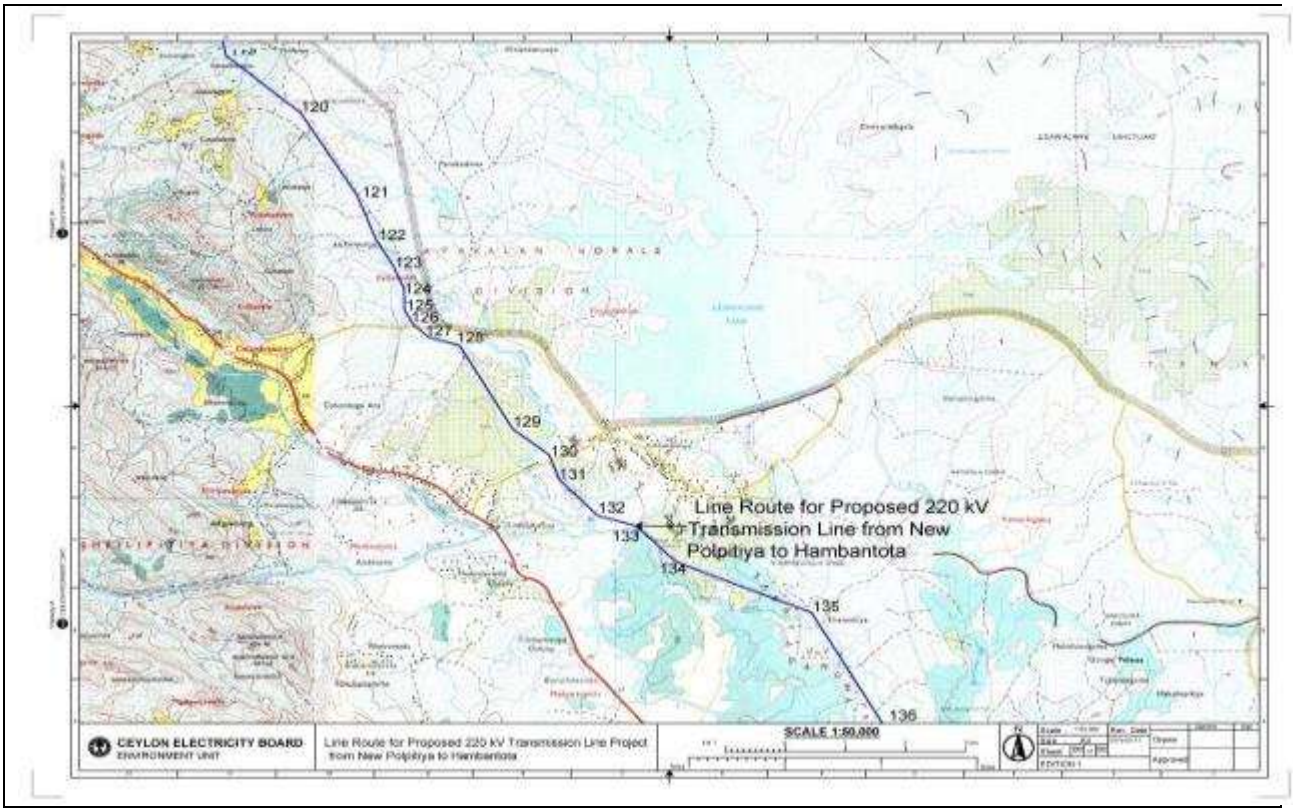
Figure 2A: T-1-New Polpitiya-Hambantota 144 km, 220 kV Transmission Development (Location on topographic sheet)

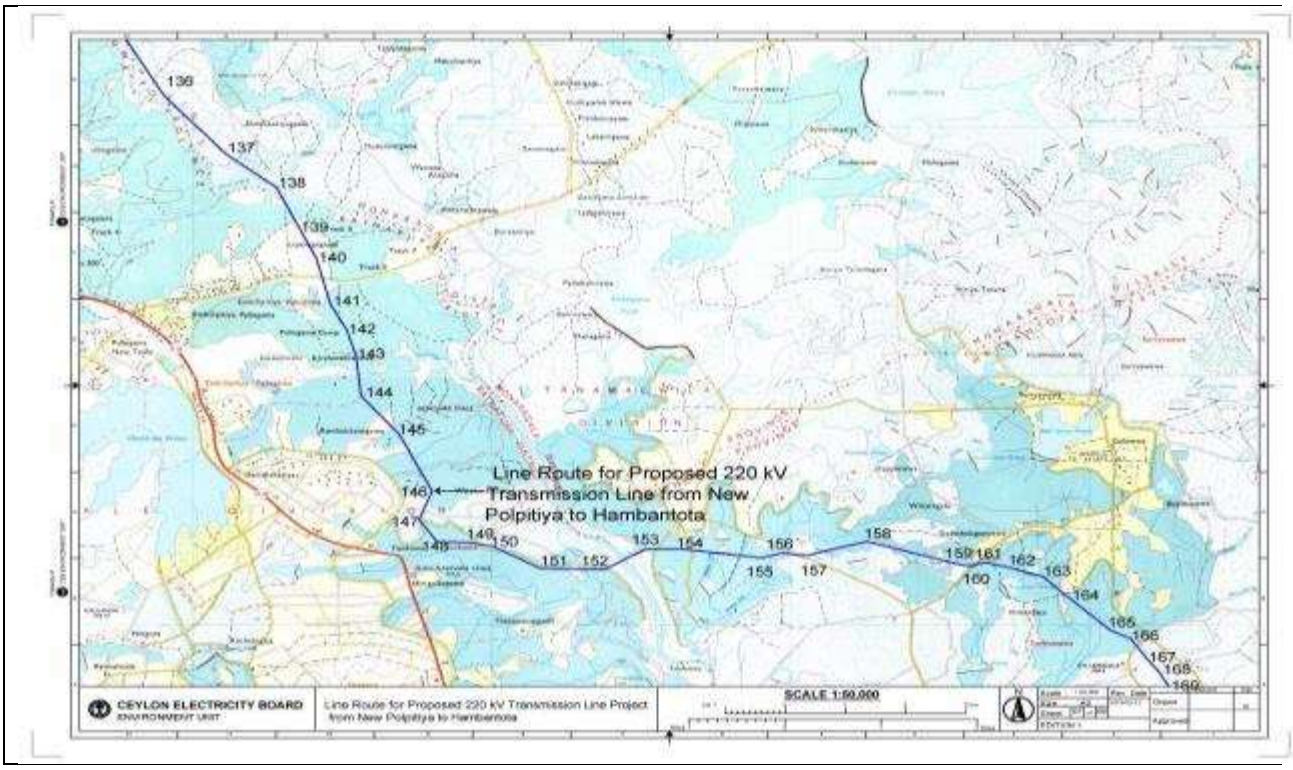



Line Route for Proposed 220 kV Transmission Line from New Polpitiya to Hambantota
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Line Route for Proposed 220 kV Transmission Line Project from New Polpitiya to Hambantota
SCALE 1:50,000


Line Route for Proposed 220 kV Transmission Line from New Polpitiya to Hambantota
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Line Route for Proposed 220 kV Transmission Line Project from New Polpitiya to Hambantota
SCALE 1:50,000


Line Route for Proposed 220 kV Transmission Line from New Polpitiya to Hambantota
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Line Route for Proposed 220 kV Transmission Line Project from New Polpitiya to Hambantota
SCALE 1:50,000


Line Route for Proposed 220 kV Transmission Line from New Polpitiya to Hambantota
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Line Route for Proposed 220 kV Transmission Line Project from New Polpitiya to Hambantota
SCALE 1:50,000


Line Route for Proposed 220 kV Transmission Line from New Polpitiya to Hambantota
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Line Route for Proposed 220 kV Transmission Line Project from New Polpitiya to Hambantota
SCALE 1:50,000

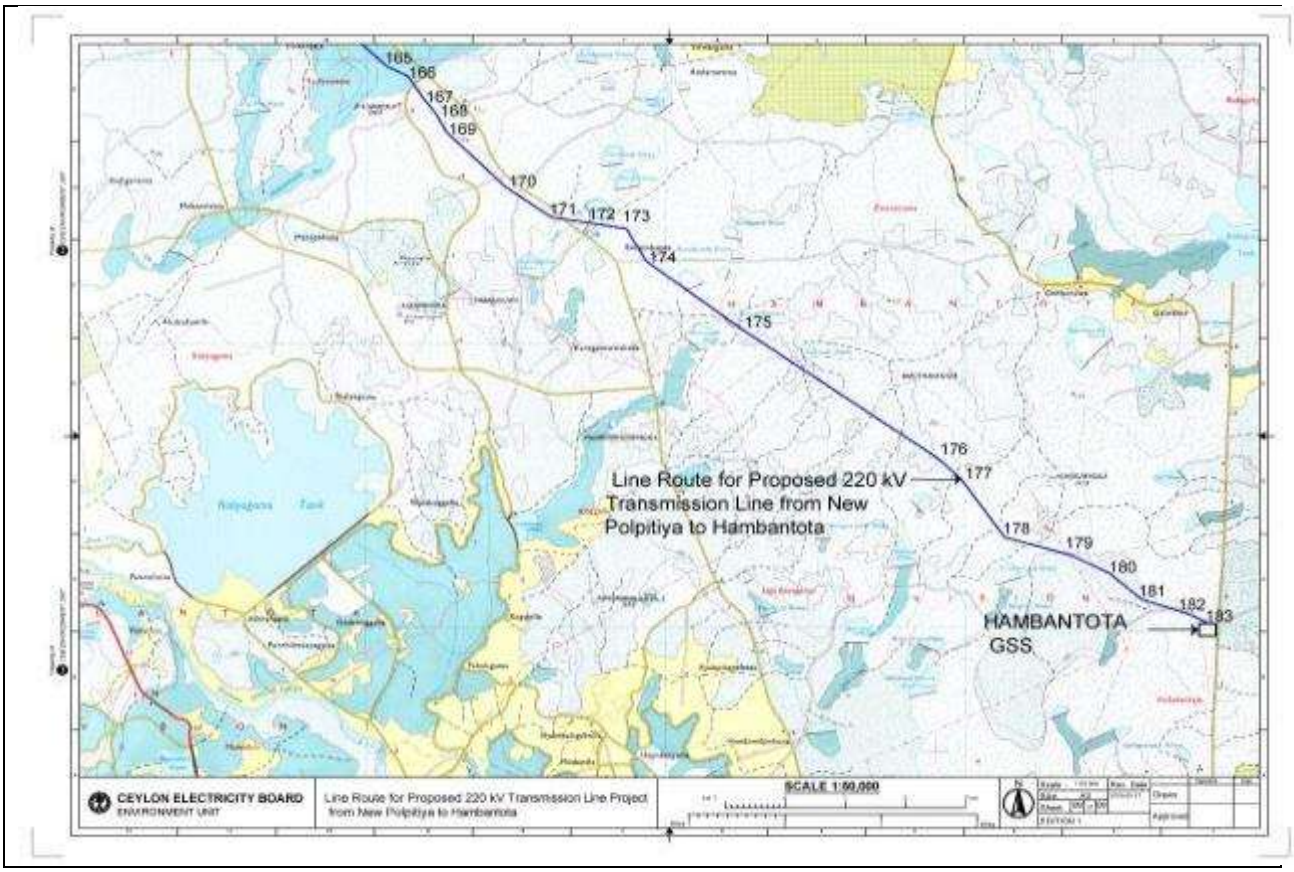

Line Route for Proposed 220 kV Transmission Line from New Polpitiya to Hambantota
HAMBANTOTA GSS
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Line Route for Proposed 220 kV Transmission Line Project from New Polpitiya to Hambantota
SCALE 1:50,000

Figure 2B: T-1-New Polpitiya-Hambantota 220 kV Transmission Development (Photograph)

	
Picture of Polipitiya 220 kV GSS under Construction	Picture of Existing Hambantota 132 kV GSS
	
House near AP7	AP6 in a tea small holding, Kohowilakanda, Paratalawa

Figure 3: T-2. - Construction of Colombo B & Colombo C132/11 kV Grid Substations (Photographs)

Picture of Colombo B GSS (old)	Picture of junction of 132 kV cable on the road for Colombo GSS
	
Colombo C substation land	Colombo Substation C- old transformers

Figure 4: T-3. - Augmentation of Biyagama Old Grid Substation and T-5. - Construction of Biyagama 220/33 kV Grid Substation

	
Picture of Biyagama GSS (from outside)	Picture of Bay at Biyagama GSS

Figure 5: T-3. - Augmentation of Kotugoda Old Grid Substation

	
Picture of Kotugoda GSS (from outside)	Picture of Bay at Kotugoda GSS

Figure 6: T-3. - Augmentation of Kolonnawa Old Grid Substations (Photograph)

Picture of Kolonnawa GSS (from outside)

Picture of Bay at Kolonnawa GSS

Figure 7A: T-4. - Padukka – Horana 132 kV Transmission Development (Location on topographic sheet)

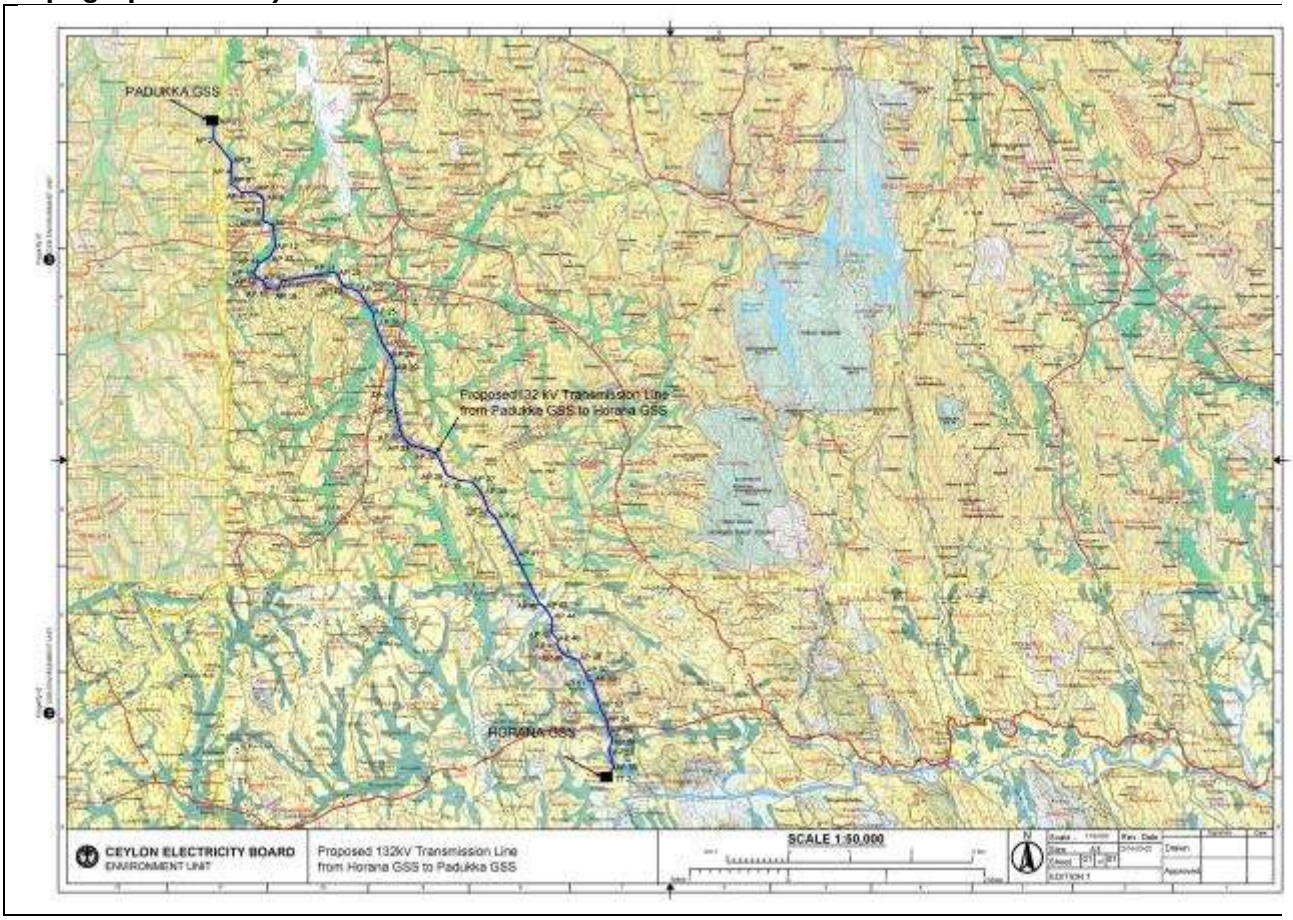


Figure 7B: T-4. - 132 kV Transmission GSS's at Padukka and Horana (Photographs)

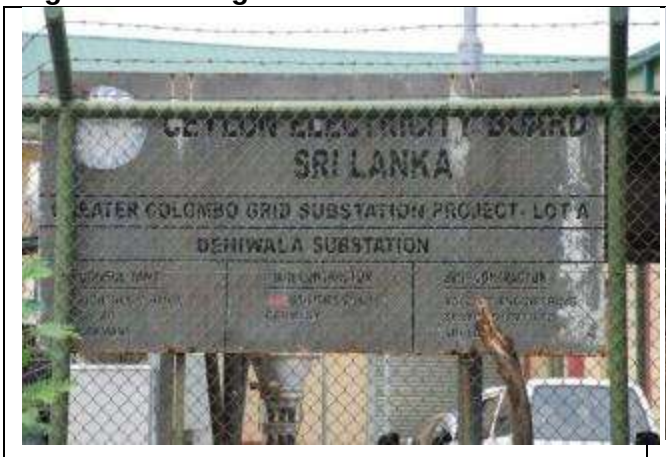
Picture of Padukka 220 kV GSS under Construction

Picture of Horana 220 kV GSS

Line through paddy fields

Line pass through rubber plantation before reaching Horana GSS

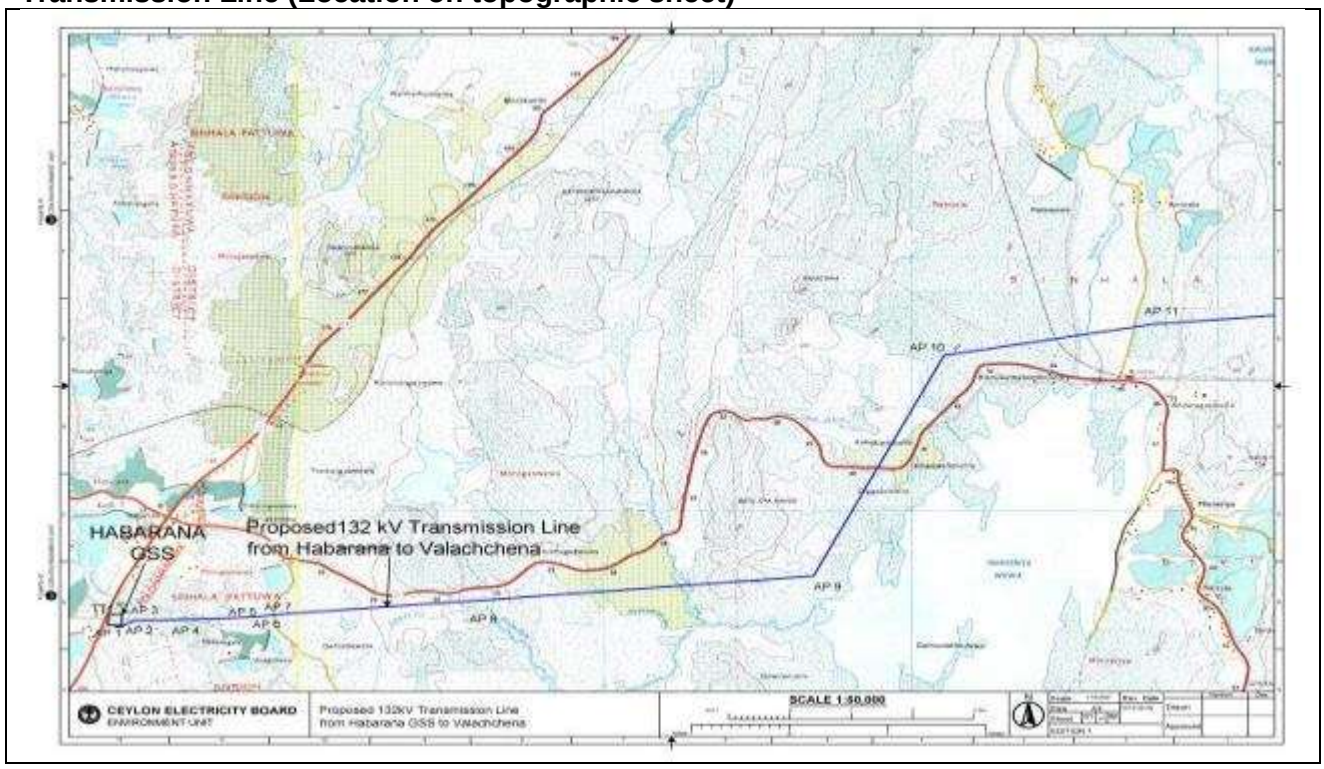
Fig 8. T-6. - Augmentation of Dehiwala Grid Substation (Photographs)

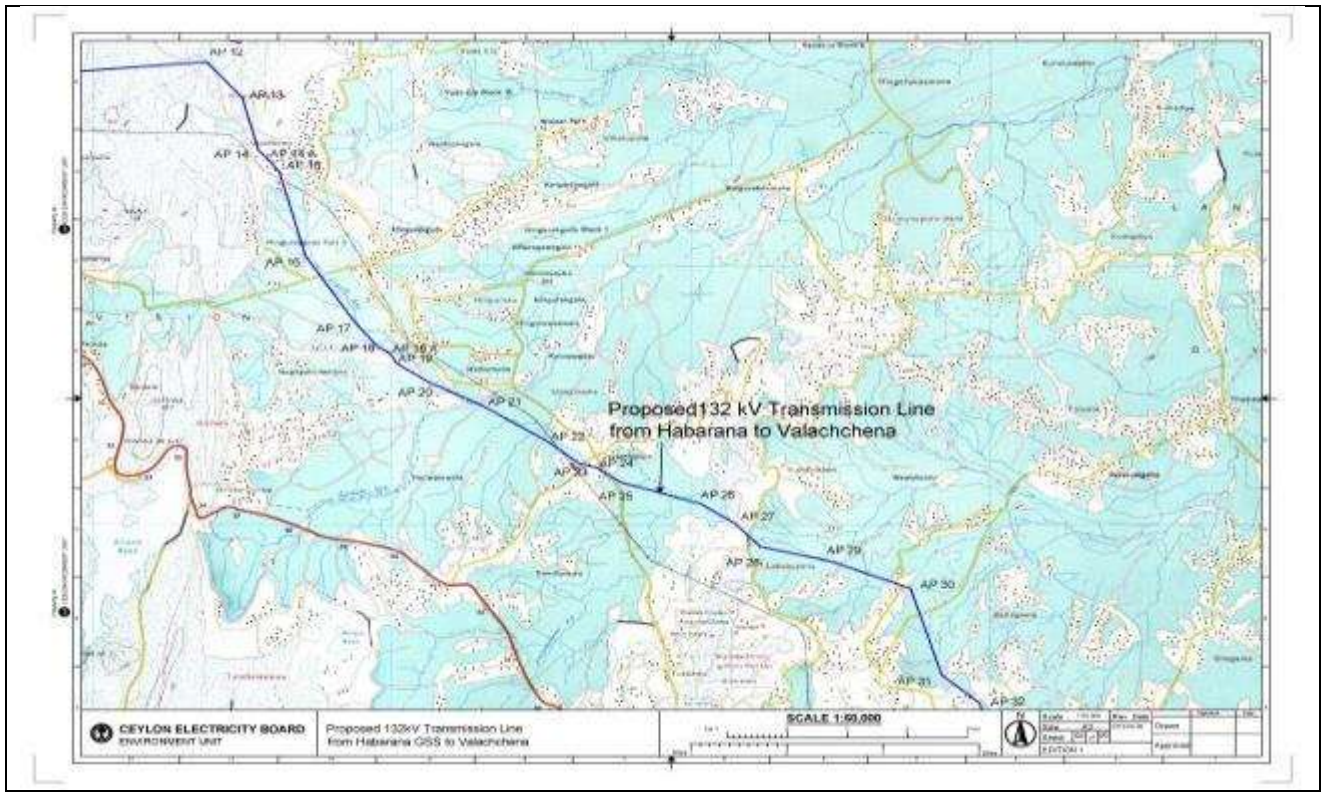


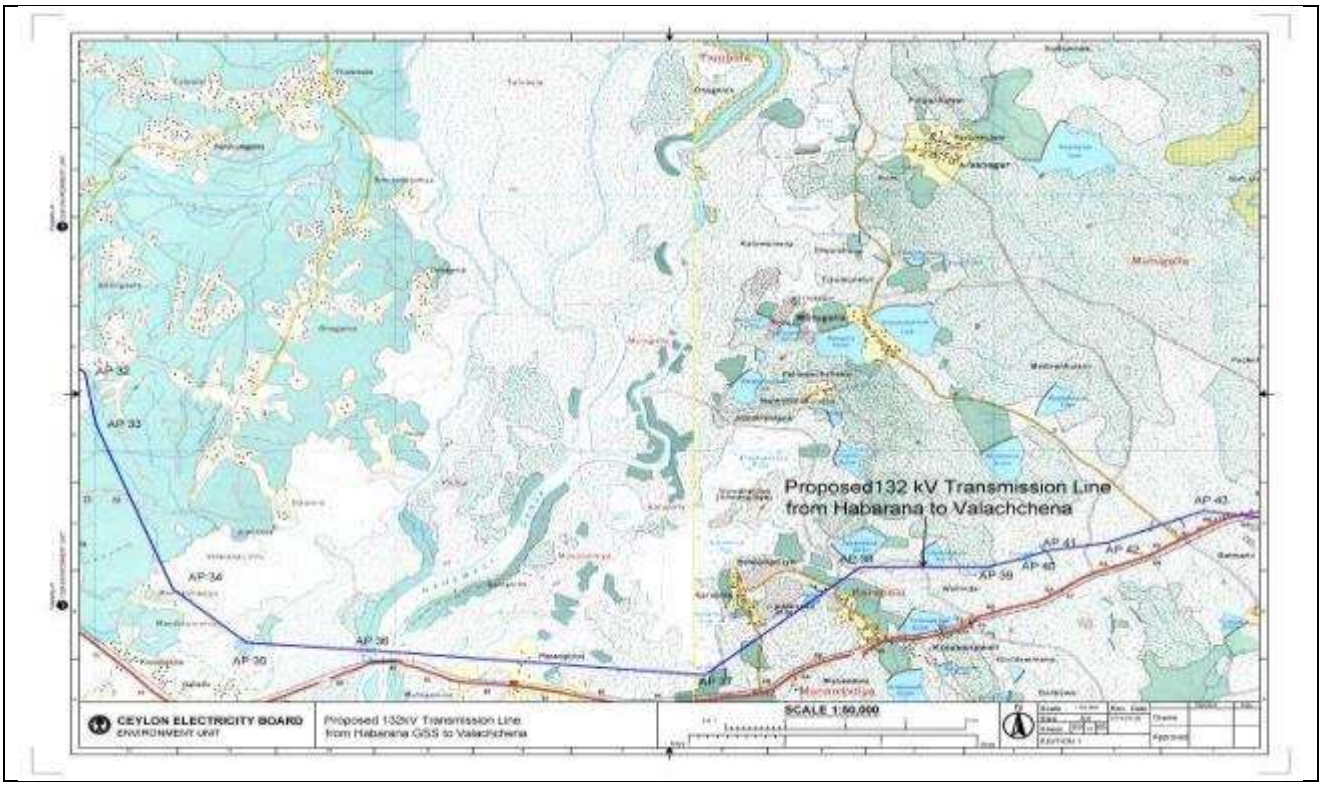
Picture of Dehiwala GSS (from outside)

Picture of Bay at Dehiwala GSS

Fig 9A. T-7. - Second Circuit Stringing of Habarana – Valachchenai 132 kV Transmission Line (Location on topographic sheet)






Proposed132 kV Transmission Line
from Habarana to Valachchena
AP 32
AP 33
AP 34
AP 35
AP 36
AP 37
AP 38
AP 39
AP 40
AP 41
AP 42
AP 43
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Proposed 132kV Transmission Line
from Habarana GSS to Valachchena
SCALE 1:50,000


Proposed132 kV Transmission Line
from Habarana to Valachchena
AP 43
AP 44
AP 45
AP 46
AP 47
CEYLON ELECTRICITY BOARD
ENVIRONMENT UNIT
Proposed 132kV Transmission Line
from Habarana GSS to Valachchena
SCALE 1:50,000

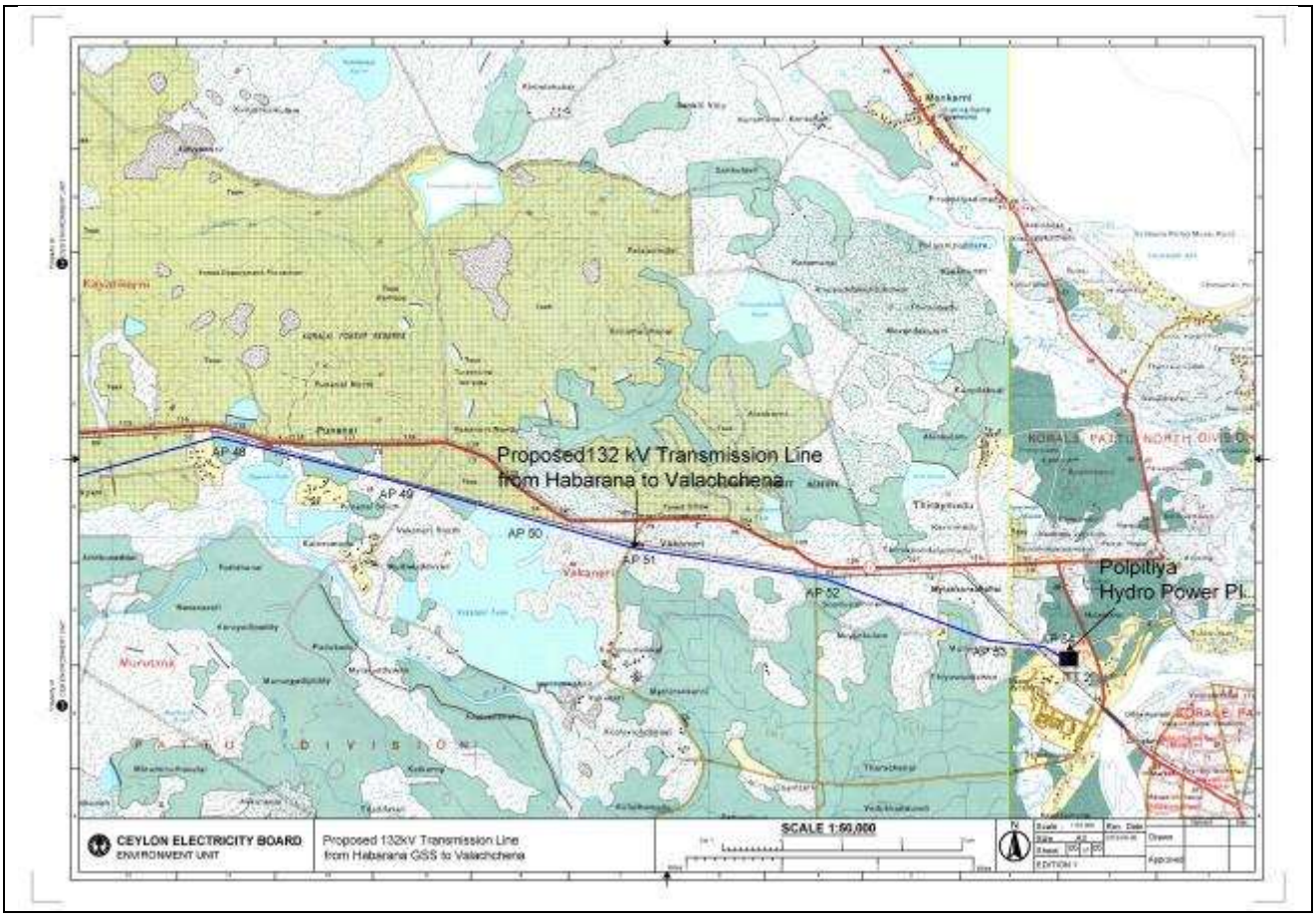


Fig 9B. T-7. - Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line (Photographs)

	
Picture of the existing Habrana GSS and existing extra bay	**Single Strung circuit of 132 kV**

Fig 10. T-6.T-8. - Augmentation of Madampe 132/33 kV Grid substation

	
Picture of Madampe GSS, Suduwella (from outside)	Picture of Bay at Madampe GSS

3.5 Size and Magnitude of the Operation

3.5.1 T-1. - New Polpitiya-Hambantota 220 kV Transmission Development

61. The 144 km, 220 kV transmission line from Polpitiya GSS to Hambantota proposed GSS traverses wet, Intermediate and the dry zones of the country. The line crosses five districts, Nuwara Eliya, Kegalle, Ratnapura, Monaragala, and Hambantota. First three districts are located in the wet zone except the eastern tip of Ratnapura district. Monaragala and Hambantota districts are situated in the intermediate and the dry zones of the country, respectively. The line from Polptiya to Balangoda is (AP01- AP83) located in the wet zone and the main land uses/ habitats are the home gardens, tea, rubber and coconut plantations, paddy fields, lowland rain forest (near AP 9), degraded forest, grasslands and scrublands. From Balangoda to Pussatota (AP84-AP108) is in the intermediate zone and the land uses are home gardens, paddy fields, vegetable cultivation lands, chena lands, and scrublands. The rest of the transmission line (AP109- AP 183) is in the dry zone and the land uses/ habitats are paddy fields, home gardens, Teak plantations, degraded forests, scrublands, banana cultivations, vegetable cultivated lands, and open/ degraded lands near the proposed Grid substation in Gonnoruwa, Hambantota.

62. The line crosses Kelani river between AP 1-2, Madagal Oya between AP 22-23, Kuru Ganga between AP 35-36, and Walawe river four times between AP 73-74, AP 134-135, AP 138-139, and AP 152-153. Forest Reserves or Protected Areas are not found within the RoW of 35 m. Several Forest Reserves, two Sanctuaries and a National Park are situated in the area and the distance from angle points to the reserves are shown in **Table 8** as follows:

Table 8 : Distance of line from various forest reserves, sanctuaries, national park

No	Area	Minimum Distance from Boundary
1	Gilimale Forest Reserve	800 m (south of the line, near AP 47),
2	Peak Wilderness Sanctuary	800 m, east of the line, near AP 28; 200 m north of the line near AP35, 500 m, north of the line near Mapalana Water fall and AP 46, 1.5 km north of the line near AP 52, 500 m north of the line near AP 54),

No	Area	Minimum Distance from Boundary
		Alupola Water Falls (250 m north of the line from AP 57)
3	Bambarabotuwa Forest Reserve	3.5 km (south)
4	UdaWalawa National Park	600 m east of the line from the AP128
5	UdaWalawa Reservoir	1.2 km east of the line from AP 129 &130
6	Madunagala Sanctuary	100 m south west of the line near AP 169 & 170

63. The major environmental/ social issue is the cutting down of large number of trees in home gardens, forest areas and plantations within the 35 m RoW, From Embilipitiya, via Suriyawewa to Hambantota, the line passes through paddy fields and banana cultivated lands and the number of trees to be removed is less. The line traverses mainly through man-modified habitats in all three climatic zones of the country. Temporary impacts are foreseen on loss of crops during construction and loss of some trees is also anticipated. The line is not passing through any wildlife sanctuary, national park or ecologically sensitive area which are present in the nearby area of ROW. The line has approximately 183 angle towers and 193 suspension towers in its 144 km length.

64. The proposed GSS at Hambantota is located in the Managed Elephant Range (MER), extreme south of the MER in **Table 9** below and north of PS1 (**Fig 11**) of Greater Hambantota zoning map prepared for the Strategic Environmental Assessment for the Greater Hambantota Development Plan.

Table 9: Details of T-1: Hambantota 220 kV substation site

SNo.	Feature	Description
1	Area of land	4.0 ha
2	Geographical coordinates	06.186755 81.126701
3	Village / town	Hambantota
4	Ownership of land	Govt. Mahaweli Authority of Sri Lanka
5	Slope/Plain land	Flat
6	Kind of land	Degraded land, scrubland next to the Gonnoruwa road
7	River (if any)	None
8	Permanent feature nearby if any	Existing Hambantota GSS

65. The proposed Hambantota GSS will be located in the southern corner of the new MER (Managed Elephant Range) and the transmission line is constructed outside the MER (*line marked with angle points*). Airport & airport related activity zone (AA) is situated within the MER and a part of the Central Business District (CBD) is found in the southwest part of the MER where the proposed GSS will be constructed. The maps to the area are attached in Figures below. **Figure 11** gives the zoning map of Greater Hambantota Development Plan 2030 from the Central Environmental Authority. **Figure 12** shows the forest map and **Figure 13** gives the land use map. Only the GSS land in Gonnoruwa is situated in the MER and the line is passing through Walawe Left Bank (WL1) Development Area. The proposed Hambantota GSS will occupy only 4 ha within southern corner of the MER, which is not yet declared legally as a Protected Area (PA), and adjacent to the main road to Gonnoruwa. There are no other developments proposed in the area at present.

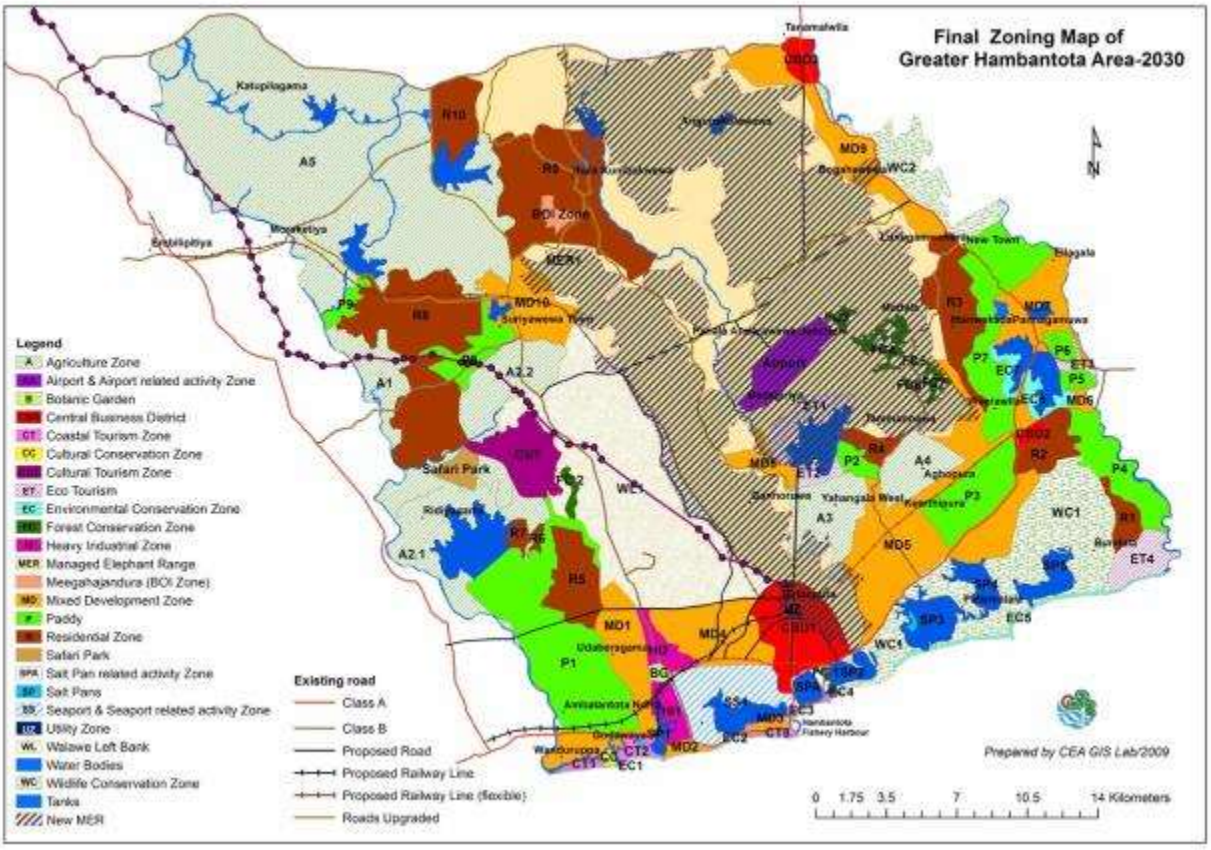


Figure 11: Final Zoning Map of Greater Hambantota Area - 2030

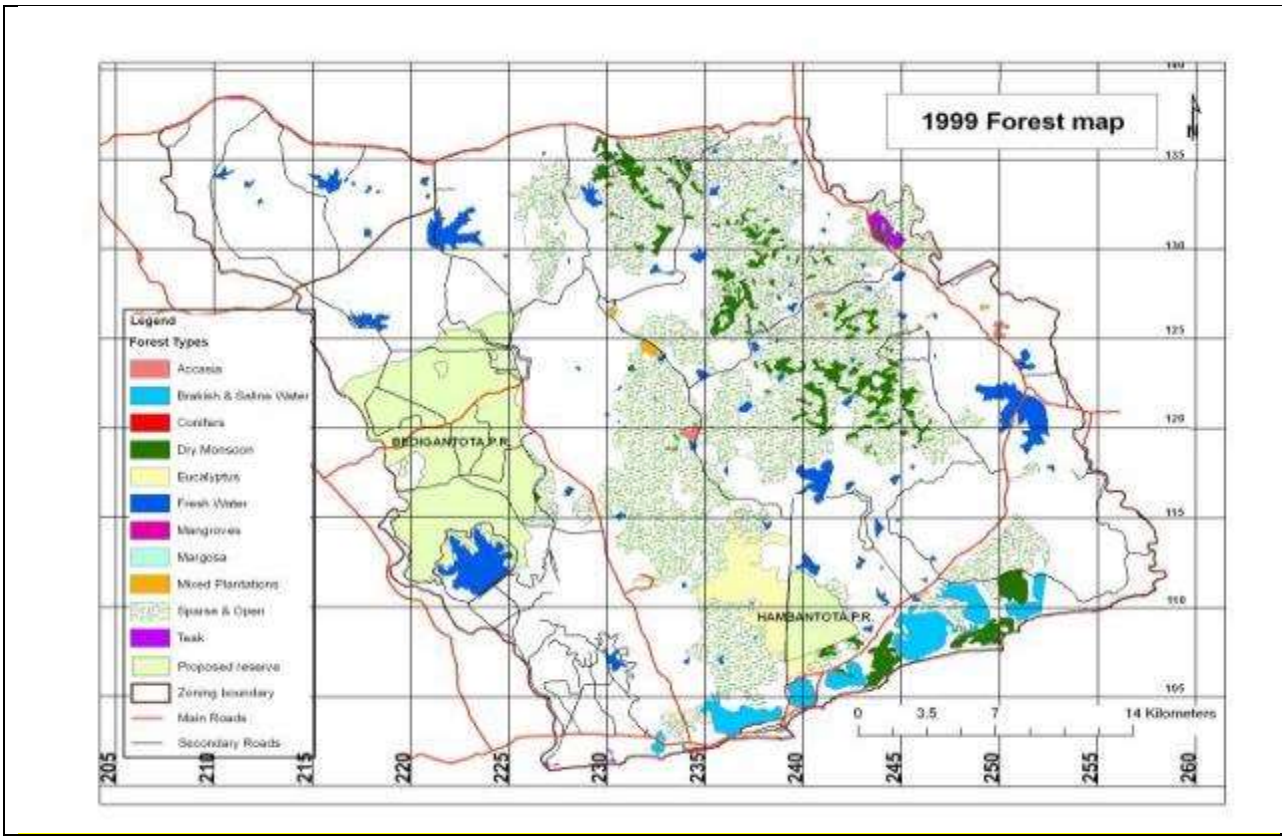


Figure 12: Forest Map of Hambantota Area

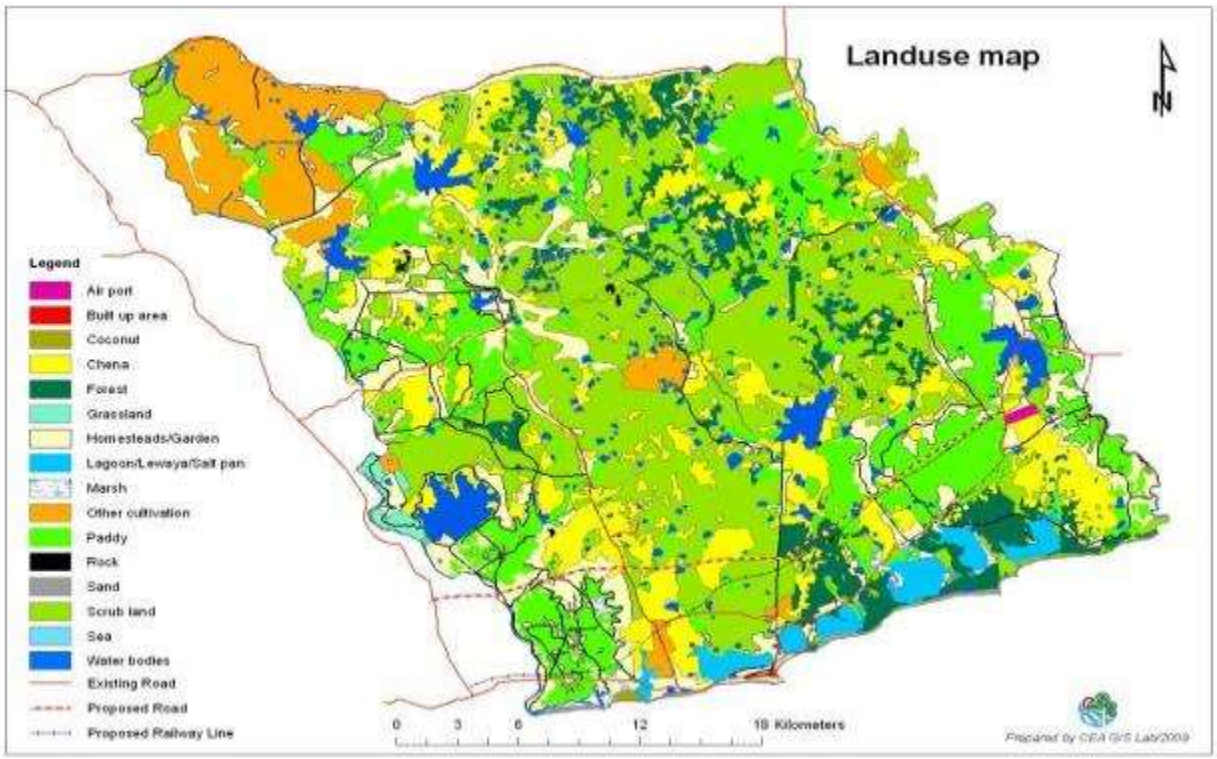


Figure 13: Landuse Map of Hambantota Area

66. Details regarding the transmission lines, location of the towers resulting from the surveys undertaken by CEB are presented in **Annexure 3** and a summary in **Table 10** below.

Table 10: T-1. Polpitiya-Hambantota 220 kV transmission line

SNo.	Detail	Description
1	Line Length estimated	144 km
2	Total Tower locations	Angle Towers- 183, Suspension Towers- 193
3	Total Nos. of Railway Crossing	None
4	Total Nos. of road crossings	Kithulgala- Ginigathhena road near AP 1, Maliboda road near AP 22 Malwala-Siripagama Road near 41,42, A4 road (Balangoda- Badulla road) near 80,81,82, Wikiliya road at AP 92, Weligepola-Handagiriya road near 98,99,100, B427 road for 132, Embilipitiya –Moraketiya road for 140,141, Sooriyawewa-Padalangala road for 159, Hambantota – Gonnoruwa road near the GSS
5	Total Nos. of HT line crossings	220 kV line cross between Angle point 1-2, 132 kV line cross between 1-2, 91-92, 97-98,
6	Nos. of forest trees to be felled	370
7	No of fruit trees to be felled	1261 excluding Teak 1027, Rubber 589 and 2142 other trees
8	Distance from nearest Wildlife sanctuary/ National Park	Gilimale Forest Reserve, 800 m (south of the line, near AP 47), Peak Wilderness Sanctuary (800 m, east of the line, near AP 28; 200 m north of the line near AP35, 500 m, north of the line near Mapalana Water fall and AP 46, 1.5 km north of the line near AP 52, 500 m north of the line near AP 54), Bambarabotuwa Forest Reserve 3.5 km (south), UdaWalawa National Park 600 m east of the line from the AP128, UdaWalawa Reservoir 1.2 km east of the line from AP 129 &130), Madunagala Sanctuary 100 m south west of the line near AP 169 & 170
9	Nos. of river crossings	The line crosses Kelani river between AP 1-2, Madagal Oya between AP 22-23, Kuru Ganga between AP 35-36, and Walawe river four times between AP 73-74, AP 134-135, AP 138-139, and AP 152-153

3.5.2 T-2. - Construction of Colombo B 132/11 kV Grid Substation.

67. The land (approximately 0.2 ha) for the existing GSS belongs to the government. No private land acquisition is required for the GSS. The location of the Colombo B GSS is in Pettah, near the Central Bus Station, Colombo city while Colombo C is situated in Kotahena. Details are given below in **Tables 11 and 12** respectively

68.

Table 11: Details of T-2 Colombo B 132/11 kV substation site

SNo.	Feature	Description
1	Area of land	0.2 ha
2	Geographical coordinates	06.93571 79.85433
3	Village / town	Pettah, Colombo 11
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing GSS land
7	River (if any)	Kelani river
8	Permanent feature nearby if any	Central Bus Stand, Colombo City

Table 12: Details of T2: Colombo C substation site

SNo.	Feature	Description
1	Area of land	0.75 ha
2	Geographical coordinates	06.950323 79. 866612
3	Village / town	Kotahena
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing GSS land
7	River (if any)	None
8	Permanent feature nearby if any	St' Benedict school playground

3.5.3 T-3. - Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations

69. Augmentation work does not require any additional land acquisition as all the activities will be confined to the existing GSS premises. Adequate space for the proposed extension is available within the existing GSS land. Salient features of the site are given in **Table13.**

Table 13: Details of T-3. Biyagama 132 kV GSS

SNo.	Feature	Description
1	Area of land	5 ha
2	Geographical coordinates	06.97107 79.97723
3	Village / town	Biyagama, Makola
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing GSS land
7	River (if any)	None
8	Permanent feature nearby if any	Oil refinery, Colombo- Katunayake expressway

Table 14: Details of T-3. Kotugoda 132 kV GSS

SNo.	Feature	Description
1	Area of land	3.5 ha
2	Geographical coordinates	07.13415 79.92656
3	Village / town	Ja Ela

SNo.	Feature	Description
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing GSS land
7	River (if any)	None
8	Permanent feature nearby if any	Millenium city

Table 15: Details of T-3. Kolonnawa Old 132 kV GSS

SNo.	Feature	Description
1	Area of land	25 ha
2	Geographical coordinates	06.93261 79.88336
3	Village / town	Kolonnawa
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing Kolonnawa GSS land
7	River (if any)	Kolonnawa Ela
8	Permanent feature nearby if any	Oil tanks-Petrolium corporation

3.5.4 T- 4. - Padukka – Horana 132 kV Transmission Development

70. Augmentation work does not require any additional land acquisition as all the activities will be confined to the existing GSS premises. Adequate space for the proposed extension is available within the existing GSS land Salient features of the site are given in **Table 16.**

Table 16: Details of B.IV: 132/33 kV Padukka GSS

SNo.	Feature	Description
1	Area of land	4 ha
2	Geographical coordinates	06.880438 80.048011
3	Village / town	Walpita, Nawalamulla
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Rubber. Paddy land
7	River (if any)	None
8	Permanent feature nearby if any	

Table 17: Details of B.IV: 132/33 kV Horana GSS

SNo.	Feature	Description
1	Area of land	2.5 ha
2	Geographical coordinates	06.729278 80.140443
3	Village / town	Horana, Poruwadanda
4	Ownership of land	CEB
5	Slope/Plain land	Undulating land
6	Kind of land	Existing GSS land
7	River (if any)	Kalu Ganga (River), 700 m
8	Permanent feature nearby if any	Board Of Investment site, Poruwadanda

3.5.5 T- 4. - Padukka – Horana 132 kV Transmission Development

71. The 23.7 km, 132 kV transmission line from New Padukka GSS (under construction) to Horana Grid substation, passes through mainly paddy fields (85%), home gardens (12.3%), coconut lands (1.7%) and rubber lands (0.9%) in Meegoda area and close to the Horana GS. Transmission line crosses the high level road (Colombo-Ratnapura road) between AP11 and AP 12, Godagama- Padukka road and the railway line between AP 15 and AP 16 near Watareka Railway station, (65 m to the railway station from the line), the railway line and Old Padukka road (B 240) between AP 17 and AP 18, old Padukka road and the railway line between AP 23 and AP 24, Padukka- Horana road between AP 25 and AP 26, Malagala road between AP 36 and AP 37, Handapangoda road and Mawak Oya (stream) between AP 41 and AP 42, Maputugala road between AP 46 and AP 47, and Panadura- Ratnapura main road near 28 km post, between AP 52 and AP 53. Most of the home gardens are located between the paddy fields. Temporary impacts are foreseen on loss of crops during construction and loss of trees (1114) is also anticipated. The line is passing through man modified habitats. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The line has approximately 57 angle towers and 17 suspension towers and the conductors shall be single Lynx per phase, double circuit line. **Annexure 3** provides inventorisation details while a summary is provided in **Table 18** below.

Table 18: B.V. Padukka-Horana 132 kV line details

SNo.	Detail	Description
1	Line Length estimated	23.7 km
2	Total Tower locations	Angle Towers- 57, Suspension Towers- 17
3	Total Nos. of Railway Crossing	Two, Watareka
4	Total Nos. of road crossings	Meegoda – Artigala Road AP 9-10 Colombo- Avissawella Road AP 11-12 Padukka- Godagama Road AP 14-15,16- 17, 22- 23 Galagedara –Horana Road AP24- 25 Poruwadanda- Hadapangoda Road AP 38-39 Horana – Ratnapura Road AP 52-53
5	Total Nos. of HT line crossings	None
6	Nos. of forest trees to be felled	None
7	No of fruit trees to be felled	Coconut – 256, Areca nut – 135, Jak – 9, Kottamba – 14, Kithul – 5, Rambutan- 3, Oil palm – 12, non fruit trees- 680
8	Distance from nearest Wildlife sanctuary/ National Park	8.7 km to Labugama-Kalatuwawa Forest Reserve

3.5.6 T-5. - Construction of Biyagama 220/33 kV Grid Substation.

72. Construction of this additional bay does not require any additional land acquisition as all the activities will be confined to the existing GSS premises. Adequate space for the proposed extension is available within the existing GSS land. Salient features of the site are given in **Table 19.**

Table 19: Details of B.V.: 132/33 kV Biyagama GSS

SNo.	Feature	Description
1	Area of land	5 ha
2	Geographical coordinates	06.97107 79.97723
3	Village / town	Biyagama, Makola
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing GSS land
7	River (if any)	None
8	Permanent feature nearby if any	Oil refinery, Colombo- Katunayake expressway

3.5.7 T-6. - Augmentation of Dehiwala Grid Substation

73. Augmentation work does not require any additional land acquisition as all the activities will be confined to the existing GSS premises. Adequate space for the proposed extension is available within the existing GSS land. Salient features of the site are given in **Table 20**.

Table 20: Details of T-6 Dehiwala substation site

SNo.	Feature	Description
1	Area of land	0.3 ha
2	Geographical coordinates	06.84586 79.87733
3	Village / town	Dehiwala
4	Ownership of land	CEB
5	Slope/Plain land	Flat land
6	Kind of land	Existing GSS land
7	River (if any)	Attidiya lake
8	Permanent feature nearby if any	Lotus Groove Housing Scheme

T-7. - Second Circuit Stringing of Habarana – Valachchenai 132 kV Transmission Line

74. This transmission line is already constructed and this subproject will involve the second stringing of the line. The length of transmission line is100 km from the Habarana GSS to Valachchenai GSS. It traverses through dry-mixed evergreen forests in Minneriya National Park, degraded lands, home gardens, paddy fields, scrublands, Flood Plain National Park located either side of Mahaweli River at Manampitiya, parallel to the Batticaloa main road and railway line near Vakaneri, Punani, Trikonamadu junction, and Welikanda. No significant environmental issues with the project recognized. Details regarding the transmission lines, location of the towers resulting from the surveys undertaken by CEB are presented in **Annexure 3** and a summary in **Table 21** below.

Table 21: T-7 Habrana-Valachchenai 132 kV line details

SNo.	Detail	Description
1	Line Length estimated	100 km
2	Total Tower locations	312
3	Total Nos. of Railway Crossing	One
4	Total Nos. of road crossings	06
5	Total Nos. of HT line crossings	Two

SNo.	Detail	Description
6	Nos. of forest trees to be felled	None
7	No of fruit trees to be felled	None
8	Distance from nearest Wildlife sanctuary/ National Park	Line traverses Minneriya National Park, Flood Plain National Park

3.5.8 T-8. - Augmentation of Madampe 132/33 kV Grid substation

75. Augmentation work does not require any additional land acquisition as all the activities will be confined to the existing GSS premises situated close to the Chilaw- Kurunegala road (B247), about 3 km from Colombo- Negumbo road. (A3). Adequate space for the proposed extension is available within the existing GSS land (about 1 ha.) at Suduwella, Madampe (coordinates 07 29.847E, 79 51.120E). A Teak tree and Rain tree have to be cut down to get the space for the augmentation work. Salient features of the site are given in **Table 22.**

Table 22: Details of T-8: Madampe substation site

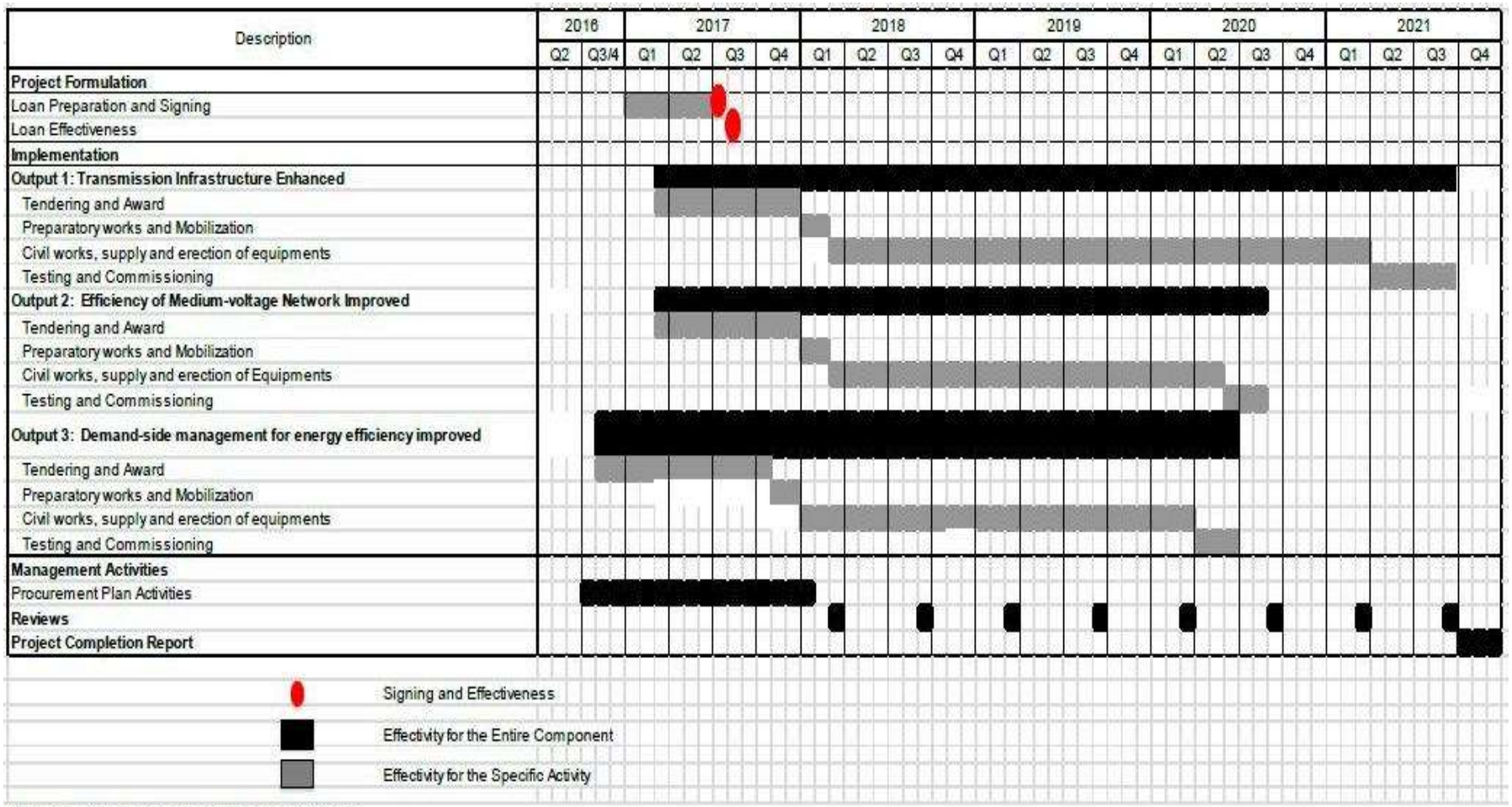
SNo.	Feature	Description
1	Area of land	1 ha
2	Geographical coordinates	N - 07°29'847" E - 79°51'120"
3	Village / town	Madampe, Puttalam district
4	Ownership of land	Government
5	Slope/Plain land	Flat land
6	Kind of land	Non Agricultural
7	River (if any)	None
8	Permanent feature nearby if any	Chilaw Lagoon

3.6 Implementation Plan

76. The Polipitya GSS, Habrana GSS and Padukka GSS were funded under previous ADB projects. The construction of substation involves utilisation of existing CEB lands for 220/33 kV Biyagama, 132/33 kV old Biyagama, Kotugoda and Kolonnawa Old Grid Substations GSSs, 32/11 kV Colombo B & C GSSs, 132/33 kV Madampe GSS. For the proposed 220/33 kV Hambantota GSS will be built on 10 acres government land (owned by Mahaweli Authority and included in the Greater Hambantota development Area plan- 2030).

77. In case of construction of new transmission line, the project would involve survey work, forest work and clearance, design and engineering of plant equipment, floating tenders for procurement, civil work related to 220/132 kV line and 220/132/33 kV GSS testing and commissioning. Total project work is expected to complete in 36 months. The overall project implementation schedule for the project is attached in **Table 23**.

Table 23: Overall Project Implementation Schedule



Source (s): Asian Development Bank

The bar charts (Black and Grey) denote intermittent activity

4.0 DESCRIPTION OF ENVIRONMENT (BASELINE DATA)

4.1 Kegalle District

No.	List of Subprojects in the Area
T - 1	New Polpitiya-Hambantota 220 kV Transmission Development - 144 km long line

78. **Figure 14** shows Kegalle District.

4.1.1 Physical Resources

4.1.1.1 *Topography, Geology and Soil*

79. The elevation of the district of Kegalle varies from 30 - 170 m from the MSL. The highest elevation is towards the South-East of the district. The landform features vary from plateaus to steep escarpments with medium to high elevations: and from broad valleys to steep gullies. The district of Kegalle exhibits a complex physiographic region consisting of hills and ridges, broad valleys, gorges and plateaus. The district can be divided into three main physiographic divisions based on the elevation, namely, highlands- elevation over 600 m above the sea level, uplands- elevation between 150 - 600 m above the sea level, lowlands- elevation below 150 m above the sea level. The district of Kegalle lies within the belt of Highland series. Both the khondalite and the charnokite groups occur in very close association with each other. The khondalite group is made up of variety of granulites, schists and gneisses all of which can be found anywhere in the district. Most of the soils have either developed in situ in residual material that has been derived by the weathering of the bedrock or in weathered material that has been transported for short distance. The common soil types that occur in Kegalle district are Red Yellow Podzolic soils, Reddish Brown Latozolic soil, Regsols, Alluvial soils and Pebbles.

Figure 14: Map of Kegalle District

4.1.1.2 *Climate*

80. The mean annual daily temperature in the district is estimated to be between 26.5ºC to 28 ºC and diurnal range is around 6ºC. January and February are considered as the hottest months in the Northern half of district while February, March and July are the hottest months in the Eastern section. Humidity of the district increases with the altitude and also varies from wet Zone to Dry Zone. The average humidity varies between 70-80% during the day time and between 88-94% during the night. The high rain fall is connected with high humidity and low rainfall with low humidity. The annual rainfall in the district varies from over 5,000 m in the Southern section to 2,000 mm in the Northwest. About 60%-75% of the district receives rainfall over 3,000 mm per year and hence can be described as wet area.

4.1.1.3 *Water Resources (Surface Water and Ground Water)*

81. More than 60% of the district of Kegalle is drained by the Kelani Ganga system. Another river which finds its origin in the district is the Attanagalu Oya. It has its head waters rising in the low hills having an elevation not exceeding 300 m above the sea. The head water of Maha Oya also originates from the highlands of the districts. In most divisions of the Kegalle district, some ground water sources are utilised for local domestic water supply. However, no extensive ground water aquifers have been identified in the district. The water table varies from 10- 30 m.

4.1.1.4 *Air Quality and Noise*

82. Areas where road traffic is concentrated, or where certain air polluting industries are

situated can result in a significant decline in air quality. Since most of micro-hydro projects are located in tea estates in rural areas, the Ambient Air Quality measurements are within the limits of National Ambient Air Quality Standards. Even though the air pollution is well within the National Ambient Air Quality Standards, diurnal pattern of ambient air quality parameters such as CO, SO_2 and NO_2 indicates that mobile sources have made major contributions to air pollution in these locations. Noise levels attributable to traffic and industrial activities are lower in these rural areas.

4.1.2 Ecological Resources

83. There are two wild life reserves in the District of Kegalle. The bird sanctuary situated in the Kegalle division is locally termed as 'Kurulu Kele". This bird sanctuary has an area of 113.3 hectares and was declared as a sanctuary on 14 March 1941. The second sanctuary extends to two DSD Divisions, namely Ruwanwella and Warakapola. This is known as 'Welhella-Katagilla' sanctuary and topographically this is in a more hilly area. Kithulgala (Kelani Valley Forest Reserve) was established to protect the watershed of the Kelani River. It is home to many of Sri Lanka's endemic fauna and flora. A good number of endemic birds including the Spot-winged Thrush, Green-billed Coucal, Red-faced Malkoha, Ceylon Grey Hornbill, Yellow-fronted Barbet, Ceylon Spurfowl, Ceylon Rufous Babbler, Ceylon Scimitar Babbler and Ceylon Frogmouth. Mammals include Grizzled Indian Squirrel and Layard's Striped Squirrel are resident here. The streams hold endemic fish and amphibians and the Earless Lizard is frequently seen. Boundaries of Kitulgala are rich with birds that can be spotted including the Crested Serpent-Eagle, Ceylon Spur fowl, Ceylon Hanging-Parrot and Layard's Parakeet.

4.1.3 Economic Development

4.1.3.1 *Land Use and Agriculture*

84. The district has a land area of 1,693 km^2 which is 2.6% of the total land area of Sri Lanka. 75% of this land area is devoted to three major perennial tree crops of tea, rubber and coconut. Out of total arable land, 87,000 ha is devoted to these plantation crops on both under estate and small holdings. Tea is grown at high elevations dominated by small holdings (14,089) where old tea seedlings are interplanted with an occasional coffee plant or some pepper vines. Dereniyegala division has the biggest extent of tea under estate sector. Coconut is grown thoughout the district and largest extent of land under coconut is found in the Rambukkana and Warakapola divisions which are geographically closer to the coconut triangle of the island. Rubber is grown mainly on the steeper agricultural land and on rolling hills in the estate sector. Small holders grow rubber on steep slopes as well as on valleys. The largest extent of rubber lands in the estate sector are found in Dehiowita and Yatiyantota. However, Ruwanwella, Galigamuwa, Dereniyagala and Warakapola divisions too have a considerable number of rubber estates. Coffee, cocoa, cinnamon, pepper, mulberry, cloves and many other varieties of fruits and vegetables are suited to the existing soil types. As a result, nearly 6,000 ha within the district are cultivated with minor export crops. Out of the minor exports, coffee comprises 43% while pepper and clovers occupy another 17% and 13% of land respectively. Minor export crops in the district are cultivated as mixed garden crops in home gardens along with fruits and nuts trees and trees as fuel wood.

4.1.3.2 *Industries*

85. Estate related industries are more common in Kegalle district. The stagnant nature of the estate has limited the growth of industrial employments. There are many small-scale industries

and cottage industries in the district. Industries that belong to this category are carpentry and furniture making, wood carving, light engineering and small repair, garages, brass works, gold making, mat weaving, brick and tile making, fiber works, leather industries, clay work, bakery, coir industries. Private sector industries are very limited in the district.

4.1.3.3 *Infrastructure*

86. Electricity is available for the most of the project influential areas of the district. The majority of persons living in the urban areas in the district are provided with relatively safe piped water distributed through community stand-pipes. However, similar facilities are available to less than 10% of the rural population. The main sources of drinking water in village areas is open dug wells, and a 25% of the rural population still depend on streams and ponds for drinking water.

4.1.4 Social and Cultural Development

4.1.4.1 *Population and Community*

87. A total of 11 DS divisions are located within the Kegalle district representing all ethnic and religious groups in the country. Total population distributed in the district includes: 85.9% Sinhalese, 1.9% Sri Lankan Tamil, 5.6% Indian Tamil, 6.4% Sri Lankan Moor and 0.1% others. The main four religious groups represented in the district are as follows: 85% Buddhist, 6.6% Hindus, 6.6% Muslims, 1.8% Catholics.

4.1.4.2 *Health and Educational Facilities*

88. A total of 41 hospitals are distributed in different locations of the district. These include a single Provincial general hospital, 3 Base hospitals, 5 District hospitals, 1 Peripheral unit, 7 rural hospitals, 16 Central dispensaries, 4 Central and Maternity homes and 4 Estate hospitals. Out of these, Provincial general hospital is located at Kegalle and 4 Base hospitals are located in Deraniyagala, Kithulgala, Rambukkana, Undugoda and Aranayaka.

89. Within the district altogether 564 schools including 529 national schools, 1 special school, and 34 Privens are distributed. Generally the education level of the district is considerably high. The literacy rate of the district is 91.4%.

4.1.4.3 *Sites of Cultural, Archaeological and Historical Significance*

90. Pinnawela elephant orphanage has existed since 1975 and has grown to become one of the most popular attractions of Sri Lanka. Before the arrival of the British in 1815, an estimated 30,000 elephants lived on the island. In the 1960s, the elephant population was close to extinction. This prompted the Sri Lankan government to found an orphanage for elephants that had lost their mothers or herds. Today, their number is around 3,000. Pinnawela, about 80 km northeast of Colombo, is regarded as the biggest herd of captive elephants in the world. The Pinnawela elephant orphanage is financed by the government and visitor admission charges.

4.2 Ratnapura District

No.	List of Subprojects in the Area
T - 1	New Polpitiya-Hambantota 220 kV Transmission Development - 144 km long line

91. **Figure 15** shows Ratnapura District.

4.2.1 Physical Resources

4.2.1.1 *Topography, Geology and Soil*

92. Ratnapura district is located to the Southwest and South of the Central Highlands and lies between 6°15' - 6°55 latitude and 80°10'-80° 57' longitude. The general elevation of the district ranges from 30 m to 2,135 m mountain ranges, high peaks; dissected plateaus cover a greater part of the district. From its height and slopes characteristics the district can be divided into three main morphological regions lowlands, uplands and highlands. The lowlands include mainly basins of Kalu and Walawe rivers. The uplands with an elevation of 270 m to 1,060 m consist of a ridge and valley topography. Furthermore, the uplands are also characterised by highly dissected plateaus of the Sabaragamuwa ridges, the Rakwana hills and the Southern platform of the Central Highlands. The highlands which lie at the elevation of over 1,060 m consists of plains and plateaus, mountain peaks and ridges, rock –knob plains, erosional remnants, steep rocks lands and lithosols.

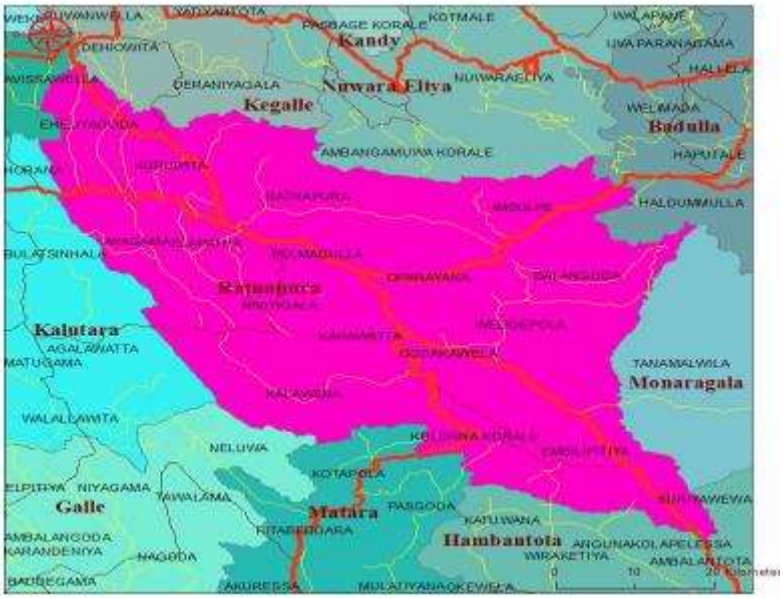


Figure 15: Map of Ratnapura District

93. Geologically, Ratnapura district is made up of the Highland series of rocks belonging to the Precambrian age. Approximately two-third of the area is made up of undifferentiated rocks of the Highland Series. These rocks are widely distributed in the area of the Southern Platform and the Rakwana massif. The charnockites and the charnokitic geneisses extend along the Southern rim of the Central Highlands and have been concentrated in the Northwest of the district. In addition, patches of marble (common dolomite, calc-granulite or gneiss) can be seen in Pelmadulla- Godakawela area in the area lying between Weragoda and Gongala, as well as between Colombage Ara.

94. Distribution of soils in the Ratnapura district has close affinity with topography, geology and climate. The highest elevation of the Southern rim of the Central Highlands, Rakwana massif and Southern platform are formed by erosional remnants. Other major soil types found in

the district are Red-Yellow Podzolic soils, Reddish Brown Earths and Low Humic Gley soils, Reddish Brown Earths and Immature Brown loams, Bog and Half Bog Soils and Alluvial Soils.

4.2.1.2 *Climate*

95. Ratnapura district falls mainly in the wet zone of Sri Lanka. The district receives rainfall mainly from South-Western monsoons from May to September. During the remaining months of the year, there is considerable precipitation due to convective rains. The average annual precipitation is about 4,000 to 5,000 mm. Temperature is manifested fairly uniformly in the low land stations in Sri Lanka and varies between 27.5 ºC and 30 ^{o}C. However, the temperature rapidly decreases with vertical ascent in the Highlands. Relative humidity varies generally from about 75 and 80% percent during the day to about 90 to 95% at night. The regimes of relative humidity and rainfall coincide: high rainfall is connected with high humidity and low rainfall with low humidity.

4.2.1.3 *Water Resources (Ground Water and Surface)*

96. Surface water resources in the project area consist of rivers that originate from the central highland area, and inland lakes and reservoirs of natural and artificial water which are used for the purpose for water storage, irrigation, and drinking water supply. Several waterfalls include Bopath Ella Falls, Handapana Falls, Ettamala Falls, Haathmale Falls, Galdola Falls and Krinda Ella Falls. These waterfalls are rich in beauty. Ratnapura district is located at Western River basin of Sri Lanka. Two major tanks Chandrika wewa and part of the Udawalawe reservoir are also located within the Western River basin of the district. The central part of the Ratnapura district is highly dissected by the tributaries of the Kalu Ganga and the Walawe Ganga. The Kalu Ganga is the second largest river in Sri Lanka with a mean flow of 280 m^3/s. Its basin has an area of 2,720 km. The Walawe Ganga lies to the east of the Kalu Ganga basin and is separated from it by a range of hills rising up to 1,000 m in height. The river flows across undulating terrain and drops gently from the foot of the Central Highlands to follow its Southwesterly course.

4.2.1.4 *Air Quality and Noise*

97. Areas where road traffic is concentrated, or where certain air polluting industries are situated can result in a significant decline in air quality. In most of the areas of this region, the Ambient Air Quality measurements are within the limits of National Ambient Air Quality Standards. Even though the air pollution is well within the National Ambient Air Quality Standards, diurnal pattern of ambient air quality parameters such as CO, SO_2 and NO_2 indicates that mobile sources have made major contributions to air pollution in these locations. Noise levels attributable to traffic and industrial activities are lower in teas estates areas which are mostly rural areas.

4.2.2 Ecological Resources

98. Two main vegetation types occur in Ratnapura district-tropical rain forest and the mountain forest. The Sinharaja forest also belongs to this type. There are also small reservations at Waratelgoda, Delgoda, Delwala, Kuduminiya, Damalakanda and Welankanda which show characteristics somewhat similar to Sinharaja. Towards the Southern part of the district, the deciduous trees populate the evergreens. Owing to chena cultivation and heavy logging operations, the dense forest cover in the district has been reduced by as much as 9% percent in recent years.

99. Singharaja Forest Reserve is the most famous rainforest of the country. This tropical rain forest is a living heritage. Biodiversity of the forest is very high and a large proportion of the flora in this forest is endemic to the country and some endemic to the Singharaja Forest itself. Of Sri Lanka's 830 endemic species, 217 trees and woody climbers are found in the lowland wet zone. Of these, 139 (64%) have been recorded in Sinharaja, 16 of which are considered to be rare. *Peak Wilderness Sanctuary* lies in the centre of the western ridges of the Central Highlands, North-East of Ratnapura, and straddles the border between Central and Sabaragamuwa provinces. It is an important watershed for three major river systems: Kelani, Walawe and Kalu rivers. Peak Wilderness is one of the few remaining areas in Sri Lanka with continuous tracts of attitudinally graded forest, raining from lowland rain forest to high altitude cloud forest. Lowland forest is restricted to a few small areas on the lower slopes of the Peak Wilderness Range. The Udawalawe National Park is situated in the dry zone of the country belonging to Sabaragamuwa and Uva provinces. The park lies within dry zone and small segment lies within intermediate zone. Park consists of dry lowland forest, riverine forest, thorny scrublands and grasslands. Udawalawe National Park is world famous for its large elephant populations. In this park, one can observe elephants at any given time of the day. Other than elephants, water buffalo, spotted and barking deer, wild boar, sambhur, jackal and ruddy, grey and striped necked mongoose are also found in this park. Though the leopard, jungle and fishing cats have been recorded in the park, their sightings are very rare. The park is also famous for birdlife. Crested serpent eagle, changeable hawk eagle, white-bellied sea eagle and grey-headed fishing eagle are the main raptors found in the park. Painted stork, open bill, little and Indian cormorant, Indian darter, many species of waders are also found within the park. Among the forest birds, are the warblers, Sri Lanka Jungle fowl, Malabar pied hornbill, Sikir Malkoha, Blue face Malkoha, common Caucal, and grey hornbill.

4.2.3 Economic Development

4.2.3.1 *Land use and Agriculture*

100. Ratnapura district has a total land area of 3,275 km^2 including 39 inland water bodies. Ratnapura has a population of 1,088,007 (336 persons per km^2 (2012 data). In the rest of the district, the pattern of population and settlements distribution closely follows the relief. Thus there is a high concentration of population in a zone stretching from Eheliyegoda through Kuruwita, Ratnapura, Pelmadulla, Godakawela, Kahawatta to Embilipitiya. Agriculture crops in the Ratnapura district consist of perennial and semi-perennial crops which mostly include cash crops, paddy and other crops (Tea, rubber, coco, cardamom). In 2002, nearly 38,759 hectares of land area was under tea cultivation. It is nearly 13% of the total area under tea in Sri Lanka. Ratnapura district is the third largest rubber growing area in the island with an extent of 21,669 hectares being utilised for the crop. This is about nearly 18% of the total area under rubber in the island.. Almost 3% of the coconut cultivation in the island is found in the Ratnapura district. Nearly 15,969 hectares of land area in the district is used for coconut cultivation. The gross extent of the paddy grown by irrigation schemes at Ratnapura district in year 2005 is around 22,793 hectares. Total of 5,605 land area of Ratnapura district is allocated for the banana and Papava cultivation. In addition, certain amount of land area is allocated for the cultivation of Kurakan, Maize, Meneri, Sroghum and Green gram.

4.2.3.2 *Industries*

101. In the Ratnapura district, only about 12% of the employed population is engaged in industrial activities. A total of 323 industrial establishments are found in Ratnapura district with

10,364 employments. The total number of industries and persons engaged in the district was enumerated in 2003 at 5916 and 12,727, respectively These numbers show that the district is little developed industrially. Ratnapura district is the center of the gem industry in Sri Lanka and contains around 80% of the gem mines. Predominant industrial activity in the district is gem mining and quarrying which account for 17% of establishments. Manufacture of chemical, petroleum, coal, rubber and plastic is also account for total of 41% of establishments. Manufacturing of food, beverages and tobacco is also fairly significant, accounting for 16%.

4.2.3.3 *Infrastructure*

102. In the Ratnapura district only, 10% of the housing units are provided with pipe-borne water. 35% obtain drinking water from protected wells. Yet a significant percent of housing unit in rural sector depended on unprotected wells, rivers, tanks and other sources for their supply of drinking water. Electricity is available for the most of the proposed project influential area. Flush and water sealed latrines facilities are available to only about 19% of the housing units in Ratnapura district. Indeed 14% of the housing units in all sectors of Ratnapura district do not have toilet facilities.

4.2.4 Social and Cultural Development

4.2.4.1 *Population and Community*

103. A total of 17 DS divisions are located within Ratnapura district representing all ethnic and religious groups in the country. The total population distributed in the district consists of: 86.8% Sinhalese, 2.8% Sri Lankan Tamil, 8.1% Indian Tamil, 2% Sri Lankan Moor, 0% Burgher, 0% Malay and 0.1% others. Mainly four religious groups are represented in the district - 86.6% Buddhist, 9.5% Hindus, 2.2% Muslims and 1.7% Catholics.

4.2.4.2 *Health and Educational Facilities*

104. A total of 47 hospitals are distributed in different locations of the district. These include single Provincial general hospital, 3 Base hospitals, 9 District hospitals, 8 Peripheral units, 6 rural hospitals, 12 Central dispensary and 6 Estate hospital. Out of these Provincial general hospital located at Ratnapura and 4 Base hospitals are located in Embilipitiya, Balangoda, Kalawana and Kahawatta.

1. Within the district altogether 618 schools including 580 National schools, 1 special school, and 37 Privens are distributed. Generally the education level of the district is considerably high. The literacy rate of the district is 88.4%.

4.2.4.3 *Sites of the Cultural, Archaeological and historical significance*

105. Sri Pada is an ancient pilgrimage, which has long attracted thousands of pilgrims from perhaps all faiths, is the pilgrimage to the sacred mountain, Sri Pada, popularly known in English as Adam's Peak. It is a conical mountain 7,360 feet (2,243 meters) high, soaring clear above the surrounding mountain ranges. According to a legend, when the Buddha visited Ceylon he planted one foot on the north of the royal city and the other on Sumana-kuta (Adam's Peak) fifteen yojanas, or about hundred miles distant. Pothgul Vihare was dating back to the 1st century B.C this temple built by King Valagambahu has cave paintings and a statue of the Reclining Buddha. An interesting sculpture of a devil with his mouth open and a figure ready to jump in is a representation of the Buddha sacrificing himself in one of his 550 lives. The temple

can be reached by an ascent over 450 steps. Rajasitagama are important gem mines. National Museum is representation of the prehistory of Sri Lanka, the intricate processes of gem mining and examples of the art and culture of the Sabaragamuwa province. It is located at the Ehelapola Walawwa.

4.3 Nuwara Eliya District

No.	List of Subprojects in the Area
T - 1	New Polpitiya-Hambantota 220 kV Transmission Development - 144 km long line

106. **Figure 16** shows Nuwara Eliya District.

4.3.1 Physical Resources

4.3.1.1 Topography, Geology and Soil

107. Nuwara Eliya district lies in the Central Province of Sri Lanka, between longitudes 80°24′5” and 80°57′8” East and latitudes 7°16’ 5″ and 6°45’ 02″ North. It is land locked by 4 districts, Kandy to the North, Kegalle district to the North-West, Ratnapura district to the South-West and Badulla district to the East. The land elevation varies from 3,000′ to about 8,000′ and has variety of complex landform features like mountain ranges, mountain summits, denuded plateaus, plains, parallel ranges and slopes.

Figure 16: Map of Nuwara Eliya District

108. The district belongs to the highest peneplain in this Island. The southern margin of this peneplain stretches for more than 80 km from Adam's Peak on the West and rising from around 1000′ to more than 5000′ as at the World's end running northwards from the southern margin are the highest plateau regions and the high plains stretching from Kirigalpotha to Piduruthalagala. This bare, gently undulating, grassland includes Horton plains, Elk plains, Moon plains and Kandepola -Sitya Eliya plains are at an average elevation of 6,000-7,000 feet. On the East of these high plains are Hakgala and Totupola. On the west is the Hatton plateau a deeply dissected area with strong relief having an average level of elevation between 3,500 feet and 4500 feet. The remarkable appearance of flatness in the Horton plateau is largely due to the rising of thousands of feet in sheer rock walls, common particularly in the Hatton area.

109. The Nuwara Eliya district belongs to the Highland series of the Precambrian Complex of Sri Lanka. The major rock types found are haonokites, quartzite, marbles, granites, granulitic quartzites. Charnockites, the predominant rock type are generally confined to the mountains with the less resistant rocks at the valley bottoms. Quartzites found around Nuwara Eliya, Hatton, Norton Bridge and Maskeliya from Parallel. The quartzites form prominent escarpments and ridges. Most of the Dimbulla valley is made of chanockities gneiss and this is clearly noticed on the road from Dimbulla to Nanuoya. Calcium carbonate from solution caves are found at Ella and two other caves in the Norton bridge area.

4.3.1.2 Climate

110. Annual average rainfall of the Nuwara Eliya district is above 1,500 mm. The climatological data indicates that Nuwara Eliya at an elevation of 1800 m receives low intensity rainfall while the intensity increases around lower elevations towards Nawalapitiya that lies on the windward slopes of the Central Mountains. Unlike the wet zone of the district that receives rainfall during the main four seasons, the intermediate zone receives rainfall only during the North-East monsoon and the two inter-monsoonal months. Unreliable rainfall and frequent dry spells is a common feature in the intermediate zone. Relative humidity of Nuwara Eliya district varies 63 - 88 % in day time and 68 -95 % at night.

4.3.1.3 River and Streams

111. The Kotmale Oya, one of the seven major tributaries of Mahaweli formed by its several head streams arise in the core of the central highlands. The Dambasatalawa Oya originating in Ambewela hills flows into Agar Oya and joins Nanu Oya to meet Kotmale Oya. Pundalu Oya has its source in Great Western and Ramboda Mountain and Punna Oya in Kikilliyamana Mountain. The many other tributaries of the Kotmale Oya are Ganthera Oya, Devathuru Oya, Hyimal Oya, Nidahaskotuwa Oya and Niyangandara Oya. The district is basically suited for the development of water power, the only source of indigenous energy in Sri Lanka. The tributary of Maskeliya Oya with catchments of 129.5 km^2 was dammed at Mousakelle to detain 123 million m^3 to generate hydro-power at Polpitiya. The tributary of Kehelgama has been fully tapped with a 48 m^3 million reservoir at Castlereagh and a small reservoir at Norton and the second to another plant at Laxapana.

4.3.2 Ecological Resources

112. Nuwara Eliya offers a combination of attractions, such as healing climate, scenic beauty, wooded wilderness, flowery meadows, and its high plateau. Nuwara Eliya is an oval shaped mountain valley, the plateau being 6,240 feet above the sea level.

113. Horton Plains, its surroundings forests and the adjoining Peak wilderness, constitute Sri Lanka's most important catchments area of almost all major rivers. The plains are also of outstanding scenic beauty and conservation importance, containing most of the habitats and endemic plants and animals representatives of the country's wet and montane zones. The Western slopes support the most extensive area of montane cloud forest surviving in the country. This lies 32 km south of Nuwara Eliya in the Central Highlands of Central Province. Horton Plains comprises a gently undulating highland plateau at the Southern end of the Central mountain mass of Sri Lanka. It is dominated to the north by Mount Totupola kanda (2,357m) and to the West by Mount Kirigalpotta (2,389m), Sri Lanka's third and second largest peaks, respectively. Horton Plains is well recognised for its rich biodiversity, its flora given to a high level of endemism. 5% of the species are found to be endemic to Sri Lanka. The town is a base for visits to Horton Plains National Park. This is a key wildlife area of open grassy woodland. Species found here include Leopard, Sambar, and the endemic Purple-faced Languor. Endemic highland birds include Dull-blue Flycatcher, Sri Lanka White-eye, and Yellow-eared Bulbul. The park also has a well-visited tourist attraction at World's End, a sheer precipice with a 1050 m drop. Various species of birds include the Indian Blue Robin, Pied Thrush or Scaly Thrush lurking in the denser undergrowth. Kashmir Flycatcher is another attractive bird species found in the park. Galway's Land Bird Sanctuary, close to Lake Gregory, is another wildlife site of 0.6 km^2.

4.3.3 Economic Development

114. Agriculture plays a dominant role in the economy of the district. A high percentage of 77.6 % of the employed are engaged in agriculture occupations. In Hanguruketha, Walapane and Kothmale DSDs 17%, 12% and 6% respectively of the cultivated land are under paddy. Paddy is cultivated in the comparatively flatter lands at the bottom of the valleys adjoining streams etc, and on sloping lands where terracing is done. In Hanguranketha and Walapane DS divisions paddy cultivation is done mainly by minor or major irrigation systems. Nuwara Eliya produces tea in unique flavor. The total cultivated land areas consist 49,828 ha of tea, 22 ha of rubber and 1,043 ha of coconut in Nuwara Eliya district according to census data of 2002. Vegetable cultivation is carried out extensively by encroaching on to crown land especially reservations as there is a scarcity of arable land in the district. Potato cultivation is the most lucrative agricultural activity of recent times. The principal form of land use in the past has been chena cultivation mostly confined to the undulating lands. Coconut and rubber are cultivated on a small scale in the intermediate zones. Coconut cultivation is carried out in Hanguranketha and Ambagamuwa. In Hanguranketha 1.5 % of the total land area is under coconut cultivation. In 1989, there was 833 hectares of land under coconut in the district.

4.3.4 Social and Cultural Development

4.3.4.1 Population and Community

115. A total of 5 DS divisions located within the Nuwara Eliya district representing all ethnic and religious groups in the country. From the total population distributed in the district 40.2% Sinhalese, 6.5% Sri Lankan Tamil, 50.6% Indian Tamil, 2.4% Sri Lankan Moor, 0.1 % Burgher and 0.2% Malay. Mainly five religious groups are represented in the district as follows: 37.9% Buddhist, 51% Hindus, 2.7% Muslims, 5.0 % Catholics, and 1.5% other Christians and 0.1% other.

4.3.4.2 Health and Educational Facilities

116. A total of 47 hospitals are situated in different locations of the district. These include a single district general hospital, single base hospitals Type A, single base hospital Type B, 11 district Hospitals, 2 peripheral units, 7 rural hospitals, 4 central dispensary and maternity homes and 20 central dispensary. District general hospital located at Nuwara Eliya and single base hospitals Type A at Dickoya and base hospital Type B at Rikillagaskada.

117. Within the district, altogether 527 schools including 518 national schools, 2 private non fee-levying schools and 7 private fee schools are distributed. Generally, the education level of the district is considerably high. The literacy rate of the district is 82.6 %. The educational level of the people within the district is shown in **Table 24**.

Table 24: Educational level of the people distributed in Nuwara Eliya district

No schooling	Attending grade 1	Passed grade 1-5	Passed grade 6-10	Passed GCE(O/L)NCGE /SSC	Passed GCE(A/L) HNCE/HSC	Degree and Above	Not started
13.2	11.3	28.5	35.5	12.1	4.6	0.4	2.2

4.3.4.3 Sites of Cultural, Archaeological and Historical Significance

118. There is a gravestone of one British governor located in the very corner of the golf grounds. Folklore in Nuwara Eliya says that in every year this gravestone is struck by a lightning shock. Another place related to folklore is the Hindu Temple called "Seetha Kovil" (Hanuman Kovil). It is found on the way to Badulla from Nuwara Eliya before reaching the Haggala Botanical garden. The temple is located in the village called "Seetha Eliya". The folklore about this area is related to the Ramayana in Hinduism.

4.4 Monaragala District

No.	List of Subprojects in the Area
T - 1	New Polpitiya-Hambantota 220 kV Transmission Development - 144 km long line

119. **Figure 17** shows Monargala District.

4.4.1 Physical Resources

120. Approximately, 6 km (AP 135 to AP 138) of the proposed 220 kV transmission line from Polpitiya to Hambantota is located in Monaragala district of the Uva Province.

Figure 17: Map of Monargala District

4.4.1.1 *Geography*

121. Monaragala District was known as Wellassa in ancient time, and was situated in Eastern and South-East direction of Uva Province of Sri Lanka. Its total area is 5,959 km^2 and it is the second largest district in Sri Lanka. The district is located between North latitude: 6°17' - 7°28' and the East longitude: 80°50' - 81°35'. This district is bordered by Ampara District in North and East, Badulla district in West and North, Hambantota district in South, and Rathnapura district in South East. District consists of 11 divisional secretariats, 319 Grama Niladari Divisions, 1324 villages and 11 Prahdeshiya Sabhas.

4.4.1.2 *Topography*

122. Topographically Monaragala district is in a transitional zone from central highland to flat lowland. According to the landscape, three terrain types could be identified. Highly Mountainous terrain which covers the western boundary towards Badulla and Ratnapura districts; the elevation is between 550 to 1400 meters and the underlain parent rocks belong to highland series. Hilly, steep and rolling terrain which is situated between the western boundary area and undulating and flat terrain within an elevation range of 160 to 550 meters, and undulating and flat terrain, which covers the broad eastern and southern plain occupying about three fourths of the district.

123. The elevation is below 160 meters and this terrain is underlain by Vijayan series according to the geological formation. Over 60 percent of the district is less than 30 meters. Slopes are gentle in the north, east and south increasing to the west with increasing elevation. There are isolated pockets of high slopes caused by steep sided mountains particularly in the central position of the western hill country.

4.4.1.3 *Soil*

124. The soil conditions in the district vary according to the topography and the climate. However, two distinguishing soil groups can be identified from the area; the reddish brown soil and the red yellow podzolic soil. Both soil varieties are suitable for cultivation.

4.4.1.4 Climate and Rainfall

125. Monaragala district is situated in the intermediate/dry zones of Sri Lanka; it has an average annual temperature, ranging from 22.5 - 27.5°C. It receives around 2,200 mm of rainfall annually. This is usually limited to 4-5 months of the year. However, one sixth of the district receives less than 1750 mm of rainfall per year. The variation in rainfall in the area has had adverse effects on its human population. The south, south-eastern and eastern parts of the district are relatively drier than the higher north-western parts.

4.4.1.5 Water resources (Surface Water and Ground Water)

126. There are seven river basins which drain the Moneragala district. These Rivers originate in the west central highlands and flow towards east, southeast and south. Most of these rivers originate outside the district boundary and strengthen the volume by several tributaries within the district and then flow outside the district to meet the Indian Ocean. The several drainage basins are; Heda oya, Kubukkan oya, Wila oya, Menik Ganga, Kirindi oya, Malala oya, and Walawe. All of these river basins have annual flows with fluctuation levels and volumes depending on the seasonal rains and dry spells.

The groundwater consumption in Monaragala district is comparatively higher than the other districts of the country due to the scarcity of surface water. Consequently, over 2000 deep boreholes have been constructed and groundwater is heavily utilized for domestic purposes. According to the database of the National Water Supply and Drainage Board (NWS&DB), the quality of groundwater has been analyzed previously, but significant changes in water quality may occur over time corresponding to the ongoing agricultural and development activities.

4.4.1.6 Air quality and noise

Air pollution levels and noise levels are low in the district because of the low urbanization and industrialization.

4.4.2 Ecological Resources

4.4.2.1 Forests

127. The forest cover is mainly concentrated, which is described as tropical, dry, evergreen, mixed forest and is mainly a secondary climax developed after a long period of earlier civilization based on irrigated agriculture. Since then the forest area has been disturbed by chena agriculture and in more recent times by large scale illicit felling. The natural forest is divided into three vegetation classes: high forest, riverine or gallery forest and dry scrub. A considerable extent of vegetation cover in the district is found in the forms of Savanna and grassland, both of which are ecologically categorized as "Fire climax" or "Anthropo-climax" as human activities is cause for their existence. The savanna in west and northwestern area of the district (Bibile, Medagama and Madulla AGA divisions) is well known for their medicinal trees in

the upper strata. The common species found are Aralu (*Terminalia belerica*) Bulu (*Terminalia Chebula*), Nelli (*Embilica Officinalis*), Kahata (*Careya arborea*), and Gammalu (*Pteracarpus marsupium*). The ground (lower) stratum of savanna is dominated by grass varieties like Mana (*Cymbopogon confertiflorus*). The grasslands are found in southern dry areas (Buttala and Thanamalwila), bordering forest areas, and they are locally known as "Dry Patanas". They are dominated by guinea grass (*Panicum maximum*), illukl (*Imperata Cylindrica*) and Mana. Illuk is widely spread in flat and undulating dry areas, where extensive chena has been practiced, and chena farmers believe that Illuk is an indicator of poor soils and claim that they are very difficult to eradicate.

128. The forested area (natural reserves and parks) of the district is inhabited by a diverse fauna, which includes six endangered, and two threatened animal species. The endangered species are the elephant, leopard, Red face Malkoha, Estuarine Crocodile, Bengal Monitor and Python. According to local sources, Malkoha is also found as endemic specie in Sri Lanka. The Bengal Monitor and Leopard have the widest distribution, and mentioned exceptional three species are most commonly observed in riverine forests. Monaragala holds some unique fauna that can only survive if the Natural Habitats are protected. The detail of fauna of the area is not known and more studies are needed. During the dry period elephants and other animals tend to congregate closer to perennial streams and tanks and riverine forests, and in the wet season they disperse and enter highland areas for feeding. There are also a number of endemic animals which include species of fish, amphibians, reptiles and mammals. Other relatively large mammals found in the area are wild boar, sloth bear, deer and sambur. A majority of the 251 resident bird species found in Sri lanka are also found in the area and during the winter months, at least 75 other bird species are migrants from Europe and other northern countries.

4.4.2.2 Wildlife

129. Out of the wildlife habitats, most important area is the Yala National Park and the extensions of forest to the north inside the district boundary plus the adjacent Kumbukkan and Panama forest reserves and the Lahugala sanctuary to the east of the boundary. The other park habitats like Uda Walawe are mainly covered in chena and scrub jungle and less important compared to Yala which provides high forest, grassland and perennial streams to be a good habitat. Some of the interesting natural habitats are: **Savanna Grasslands** - Both upland and lowland. Their locations are known, but detailed mapping is needed, in terms of the different types. These grasslands are found in the North-Western part of the district. **Intermediate Forests** - few patches probably still exist along the western sector of the district. These areas need to be identified on ground. **Isolated Highlands** - There exist within the districts many locations of high elevation arising from flat terrain. These areas need to be considered as separate 'habitats'. Nothing is known of these in specific detail. **Rock outcrops** - large number of rock outcrops, or rock highlands are found in the district. These are found to harbour flora and fauna unique to this system. **Natural Streams and Waterholes** - Apart from the large streams to the major river systems, there exists a large number of small streams and isolated waterholes. These small areas have not been studied at all. Being isolated, probably seasonal waterholes and streams would be a very interesting biological system for study and research. **National Parks and Sanctuaries** - The Gal Oya National park, part of the Uda Walawe National park and part of the Ruhunu National Park are in the Monaragala District. These parks harbour a large number of dry zone fauna. Even though the species list is not properly compiled, it could be said that these areas will probably be the last bastions of this fauna if prevailing forest destruction continues. **Aquatic System** - There exists a large number of tanks, (Wewa) and rivers in the district. Their flora and fauna is generally known but its potential and productivity apart from fisheries is not adequately known.

4.4.3 Economic Development

4.4.3.1 Land use and Agriculture

130. Monaragala has a complex agrarian society which has evolved around paddy cultivation. More than 90% of the population in the region has agriculture-based livelihoods. Historically Monaragala has been a major paddy producer and agriculture has remained the backbone of the economy. In addition to paddy, the region is also famous for the cultivation of vegetables, pulses and fruits mostly grown under “Chena” (Slash and Burn) cultivation methods. Plantation crops such as tea, rubber, cocoa, sugar cane, tobacco and coconut were later introduced to this region and now exist and thrive side by side with the long-established crops.

4.4.3.2 Industries

131. The private sector plays a vital role in traditional areas of public investment such as transport, energy and telecommunication. The burgeoning high end apparel industry based at the Buttala Export Processing Zone yields many opportunities for investment. The tourism industry and leisure sector enjoys an accelerated growth after the tsunami. Agriculture in the District is the largest sector accounting for 40 percent of the Gross Domestic Product (GDP). An abundance of arable land with many lakes and reservoirs makes the District a perfect location for agro-based industries. Paddy, coconut, sugarcane and bananas are the main crops in the area.

132. Monaragala has basic attributes for successful agro-based industries, rich alluvial soil, water and labour. The District has divided the agro industry into food crops, cash crops, long-term crops, vegetables and fruits. Mechanisation of agriculture has played an important role in increasing yields. The Monaragala District is a leading area in the production of milk. Daily 11,400 litres and 5,400 litres of milk are produced from Cattle and Buffaloes respectively. Buffalo milk is used for the production of curd and cows milk is used to produce milk powder and liquid milk. Poultry is another sector which is improving in quality and production in the district. Fresh water fisheries are carried out in perennial and seasonal tanks. Increasing fish production with modern cold storage facilities would enable the fish processing sector in the District to improve its quality.

4.4.3.3 Infrastructure

133. The European Union has partnered with the United Nations Development Programme (UNDP) to provide productive infrastructure for local economic development in Monaragala district. The project which commenced in June 2015 entails the upgrading of a rice mill facility and construction of a wholesale market and a mini economic centre.

4.4.4 Social and Cultural Development

4.4.4.1 Population and community

134. The total population is reported to be about 448,194 according to the population census of 2012, with the majority being of Sinhalese origin. Population density is 80/km^2. District's residents belong to the Sinhalese majority. Other ethnic minorities include the Sri Lankan Moors, Sri Lankan Tamils, and Indian Tamils. Residents from ethnic minorities live in all parts of the District. The following **Table 25** summarizes the population of Monaragala according to

different ethnicity:

Table 25: Demographic details

Sinhala	Sri Lankan Tamil	Indian Tamil	Sri Lankan Moor
94.5%	1.4%	1.9%	2.0%

4.4.4.2 Health and Educational Facilities

Health

135. District general hospital Monaragala has a bed strength of 370 and caters to an estimated population of 501,349 in the district. It offers health services to 48,713 inward patients and 179,921 OPD patients in 2011. 115,414 patients were getting services through clinics and 5,268 deliveries have taken place in 2011. Patients are referred or transferred to DGH Monaragala from other district hospitals such as Bibila, Medagama, Siyabalanduwa, Inginiyagala, Badalkumbura, Buttala, Wellawaya and rural hospitals such as Rathmalgahaella, Pitakumbura, Buddhama, Kotagama, Nannapurawa, Deliwa, Dabagalla, Ethimale, Dombagahawella, Dombagahawella, Higurukaduwa, Okkampitiya. According to 2012 data, the mortality rate and rate of birth are 3.3 and 16.7 per one thousand respectively.

Educational facilities

136. There are 262 schools established in the district with 97,721 students. A programme launched by the Education Ministry to build 41 Mahindodaya Technical Laboratories in the Moneragala District has been successfully completed. The expenditure incurred was 600 million rupees. Accordingly, construction of 11 Mahindodaya Technical Laboratories each was undertaken in the Moneragala and Medagama Educational Zones, while 19 were built in the Wellawaya Educational Zone. A large number of students will benefit from these laboratories.

4.4.7.2 Sites of Cultural, Archaeological and Historical Significance

137. Many important and historical valued places are found in this district: Ruhunu Maha Katharagama Devalaya, Katharagama Kirivehera, Maligawila, Yudthaganawa, Buduruwagala are some of them. Senanayake Samudraya, Weheragala and Udawalawa are the prominent reservoirs situated in this district.

4.5 Hambantota District

No.	List of Subprojects in the Area
D-8	Embilipitiya GSS to Weniwelara
D-9	Gantry at Weniwelara

138. The final section of the transmission line from AP 139 to AP 183 (c. 36 km of 144 km) and the proposed Hambantota GSS are located in Hambantota district.

District Administrative Structure

139. The district has been divided administratively into 576 Grama Niladari divisions and 12 divisional secretariat areas. In addition there are 1 Municipal council, 1 Urben Council, 10 pradeshiya saba areas and 04 electorates in the District. Under the other divisions 13 police

authoritative areas, 03 zonal educational areas, 16 agrarian service divisions and 10 MOH areas are found in the district.

4.5.1 Physical Resources

4.5.1.1 Geography

140. Hambantota District which lies to the south east of Sri Lanka is 2609 square kms in extent. This is 1/25 of the total land mass of Sri Lanka. Maximum length of the district is 106 kms while the maximum width is 39 kms. The length of the coastal belt is 151 km. of the total land mass of Hambantota District 11.5 km^2 are covered by internal reservoirs. According to latitude and longitude situation, Hambantota District lies between 6.0 to 6.5 north latitude and 80.6 to 81.7 east longitude. This district is bounded by Monaragala, Rathnapura Districts on the north, Matara District on the west and Indian Ocean and Ampara District is on the south and Indian ocean is on the East (**Figure 19**).

Figure 19: Hambantota District Map

4.5.1.2 Geology

141. The District lies largely in a transitional zone, between the Vijayan Series and the Highland Series. Quartzites relating to both the Vijayan and the Highland Series can be found in the Walawe transitional zone, and around Ambalantota, where another promontory known as the Godawaya Headland occurs. From Godawaya to Bundala, the Vijayan Series is dominant. Rocks of this Series are exposed in the littoral zone around Hambantota and Bundala. There is a noteworthy outcrop of the Vijayan Series in the area towards the east of the Nonagama-Embilipitiya road. Outcrops relating to the Highland Series can be seen between the Kalametiya

Headland and Wanduruppuwa, on the west bank of the Walawe River. Also, the region lying to the west of the Nonagama- Embilipitiya road display rocks belonging to the Highland Series. Among these rocks are Charnockites, Crystalline Limestones, and Garnet-Granulites.

142. A notable difference between the Highland and Vijayan rocks in the Hambantota District lies in their structure. The coastal area is covered predominantly by Quaternary deposits. These are evident along beaches, lagoons, lakes, estuaries, and in floodplains of rivers. The Quaternary deposits have been further sub-divided into Older and Younger groups. The Older group is of Pleistocene, and occurs at slightly higher elevations in the form of basal ferruginous gravels, terrace gravels, and red-earth formations. It was possible to identify isolated patches of these sub-groups around Hambantota, Ranna, Chitragala, Mirijjawila, Bundala, and Koholankala. The Younger group of the Quaternary deposits is of Holocene age, and comprises beach rock or littoral sandstone, beach sands, estuarine deposits, dune sands, lagoonal and shell deposits. A large part of the Hambantota district is covered by beach sands and dune sands, forming a belt of unconsolidated material, almost parallel to the coast. However, beach sands are not restricted to the littoral zone, but are seen in areas of fossilized beaches in the intermediate hinterland. These have been re-worked by wind action as well as by fluvial action, during later times; evidences of these are seen, for example, around Kalametiya lagoon, the Walawe and Kirindi estuaries, and Chitragala. There is also a notable deposit of miocene limestone in the area around Minihagalkande.

4.5.1.3 Soil

143. As the map showing the Main Soil Types indicates, there are eight main soil types in the Hambantota District. The most widely distributed, and perhaps the most important among them are the Reddish-Brown Earths and Low Humic Gley soils. These soils are mainly located across the central parts of the District, particularly in the interfluve areas. Reddish-Brown Earths and Immature Brown Loams are found mainly in the Intermediate Zone, particularly on rolling, hilly terrain. Red-Yellow Podzolic soils occur mainly in the wetter regions of the western parts of the District, including the wetter parts of the Intermediate Zone. Furthermore, certain limited extents of hilly areas as well as steep rolling terrains that occur towards the western margins of the Hambantota District exhibit these Podzolic soils. Thin soils with Quartz are found mainly in the eastern areas of the District, particularly between interfluves. Alluvial soils occur mainly along river beds and delta areas, and on the terraces of perennial streams. Eroded Residual soils are found in isolated patches in the northern margins of the District, mainly towards the eastern half of the region. A large part of the coastal area and its immediate hinterland exhibit Reddish-Brown Earths, with high amounts of gravel in the subsoil, and Low Humic Gley soils. Our field work revealed that certain dried-out lagoonal beds and former beach deposits may, very occasionally, display Solodized Solonetz and Grummusol.

4.5.1.4 Climate & rainfall

144. The district which comprises abundance of dry and semi-arid climatic condition has wet zonal climatic condition. This shows again the abundance of climatic variance there in. Average temperature of the district is 27.8^{o}C and average rainfall is 111.1 mm.

4.5.1.5 Water resources (Surface Water and Ground Water)

145. Hambantota District natural drainage system comprises of rivers and 19 natural water courses. From these Walawe river, Kirindi oya, Menik ganga, Uruboku oya, Kkachchigal ara and Kumbukkan oya that flows through the eastern boundary of the district are major water courses.

Although the Ridiyagama reservoir is the biggest wewa of thirteen major lakes and internal reservoirs in Hambantota district and Muruthawela and Lunugamwehera contain the highest amount of water. More amounts of lakes are situated in Tissamaharama area. Udawalawa development project, Kirama oya, Uruboku oya, Lliyangastota, Ridiyagama, Lunugamwehera, Mou ara and Kekiriobada projects are some of them. Bandagiriya, Mahagalwewa, Beragama and Muruthawela are colonies found in Hambantota district.

146. The groundwater resources in Hambantota are found either in shallow aquifers or in deep aquifers. The shallow aquifer is formed of highly weathered rock, and is often depleted of water during the greater part of the dry period. The deep aquifer is the product of natural processes of weathering and fracturing of rocks. Often it extends from 15 to 100m. in depth, and the water is tapped through deep bore holes.

147. The main source of ground water recharge is rainfall. It must be borne in mind that the annual rainfall is low and this factor is coupled with severe variability and seasonal fluctuations. There is a high content of iron and fluoride in the groundwater. The western parts and the District contain water that shows a high iron content, while the deep aquifers of the eastern parts of Hambantota show high fluoride levels. It must be noted that shallow dug wells are the main source of drinking water in this District.

4.5.1.6 Air quality & Noise

148. Currently in Sri Lanka Air Quality is measured using levels of COx, SOx, NOx, Ozone and Particulate matter. In 1999 air quality measurements were done for one week duration at Meegahajandura in Hambantota District. According to the results recorded CO, SO_2 levels are lower than national standards and there is no adverse air pollution problems in Hambantota district.[4]

4.5.2 Ecological Resources

4.5.2.1 Forests

149. The primary factor which influences the natural vegetation of the Hambantota District is its climate, with high temperatures, excessive evaporation, and low, variable rainfall. The nature of the soil also influences the natural vegetation. Where the soils are predominantly sandy, the moisture retention capacity is very low. Consequent upon these features, xerophytic types of natural vegetation have evolved as an adaptation to the climatic and edaphic factors of the District. Thorny scrubland and shrubs are predominant. Pathok (*Opuntia nauchalis*), Koraarika (*Aloe*), Hathawariya (*Asparagus racemogus*), are a few examples of such plants which display such adaptive mechanisms.

150. It is possible to classify the natural vegetation of the Hambantota District into six broad groups:

- **Woodlands with thorny scrub:** these are found mainly in the northern and eastern parts of the District.
- **Mangroves** These occur mainly along the coastal areas, in close proximity to the mouths of rivers. Kirala (*Sonneratia acida*), Kadol (*Rhizophora*), are some common examples found in the District.

[4] There are no officially diocumented air quality and water quality analyses recorded after that period

- **Saline Swamps:** Excessive evaporation along the coastal areas lead to salt encrustations, and natural vegetation types such as Suaeda occur.
- **Strand Plants:** These are plants that have specially adapted to the sandy soils, and they spread out along the coastal region. A few examples of such strand plants are Maha Ravanawel (*Spinifex*), Bin Tharaburu (*Ipomaea pescapre*), Gokatu (*Saphora Zeylanica*), and Muhudu Kalanduru (*Cyperus arenarius*).
- **Coastal Forests:** This zone is found more towards the inland area, and comprises of short trees and shrubs such Wetakaiya (*Pandannus*), and Diyamidella (*Barrjngtonia racemosa*). Pathok is also common here.
- **Aquatic Plants associated with Inland Water-bodies;** Among the more common plants are Nelum (*Nelumbium speciosum*), Pitasudu Pala (*Boerhoaria diffusa*), Olu (*Nymphaea nauchalis*), and Kankun (*Ipomaea aquatica*).

151. One of the interesting features that we were able to discover in our field investigations was that the north-western hill slopes, and particularly Rammale Kande, was the natural habitat for a large variety of medicinal plants and herbs. Many rare plants are found in this region. Indigenous medical practitioners are of opinion that some of these plants and herbs contain special antiseptic properties.

4.5.2.2 Wildlife

152. Geographic diversity gives rich wildlife resources to Hambantota district. Yala and Bundala national parks located in the southeast edge of the district are the two conserved wildlife parks. Yala is one of the 70 Important Bird Areas in Sri Lanka. Of 215 bird species of the park, seven are endemic to Sri Lanka. The number of waterbirds inhabiting wetlands of Yala is 90 and half of them are migrants. Other water birds are also attracted to the Yala lagoons. Thousands of waterfowls migrate to the lagoons of Yala during the northeast monsoon. Including Sri Lankan elephant, 44 species of mammals are resident in Yala National Park, and it has one of the highest leopard densities in the world. 25 individual leopards are estimated to roam in Block I. The elephant herd of Yala contains 300–350 individuals. Sri Lankan sloth bear, Sri Lankan leopard, Sri Lankan elephant, buffalo are threatened species that Yala is harbouring.

153. Weerawila, Kalametiya are among the most accessible bird sanctuaries in the district. Elephants can be found in almost all nature reserves along with deer, wild boar, several species of monkeys, wild buffalo, peacocks, crocodiles, and indigenous and migratory birds of all varieties. The larger part of Hambantota is dry and sandy with brilliant sunshine all year round and great and little bases on the south and south east coast offers excellent underwater coral exploration sites.

4.5.3 Economic Development

4.5.3.1 Land Use and Agriculture

154. Total Land area under paddy cultivation is 33670.13 hectares. 76% of paddy cultivation is irrigated by major irrigation schemes.

4.5.3.2 *Industries*

155. Milk production both buffalo milk and cow milk is done in the district under animal husbandry. The coastal belt that stretches from Kudawella on the west to Pattalnangala on the

east is constituent of very attractive features. Among them peaks, lagoons, bays, sand dunes and river mouths are very important. In addition to them harbors, quays and lagoons that are important with regard to the fisheries industry receive a prominent place. Kudawella, Tangalle, Hambantota and Krinda have already been developed with modern facilities. Also there are mini fishery harbors and several lagoons where fisheries industry is done. There are several saltern that contribute countries salt production this along this coastal line. Hambantota saltern, Koholankala and Palatupana salterns are included in it.

4.5.3.3 *Infrastructure*

156. The development of the district will be made a reality by some ongoing and already completed mega projects. The major objective of these projects are to create job opportunities and increase revenue Settlement Pattern of the area. Under the Greater Hambantota Development plan several projects can be mentioned, such as Hambantota Sea Port, Mattala Air Port, Commonwealth Games Village 2018- Sooriyawewa, Dry Zone Botanical Garden, Hambantota City Centre, Administrative Complex, Conventional Centre, extension of Southern Highway up to Kataragama, extension of Southern Railway up to Kataragama, Industrial area, Beach Park/ South Asian Beach Games, and Banking Square at Siribopura. Sixty acers of land area have been given to commercial/mixed development under Urban Block project. For a bus stand at Siribopura another 10 acres were allocated. Boutique hotels, Information centres, Museum & Performing Arts centres and Tourists sale centres are proposed under the Tower Hill Design project.

4.5.4 Social and Cultural Development

4.5.4.1 Population and community

157. Total population of the district in 2011 is 5,96,617 and 2,93,567 are males while 3,03,050 are females. Accordingly, population density per km^2 is 239. From the total population 97.1% are Sinhalese, 0.4 % are Sri Lankan Tamil and 1.1% represent Sri Lankan Moors. According to the religion 96.8% are Buddhists 0.2% are Hindus and 2.5 % are Islamists.

4.5.4.2 Health &Education

158. Hambantota district has 03 Educational Zones. There are 10 MOH areas in the district.

4.5.4.3 Sites of Cultural, Archaeological and Historical Significance

159. There are two different views about the name Hambantota of them more popular view is the quay to which sea vestal “hamban” come become Hambantota. According to Professor Senarath Paranavitharana, this quay became Hambantota because Malay sea vessel arrived at this port. This Land areas coming under Hambantota District is a land mass that provides a good basic to great Sri Lankan history and culture. It was a part of historic Ruhunu Kingdom.

160. This area has contributed much in the creation of free nation civilization, pure Buddhist culture in Sri Lanka. They were the Ruhunu kings who came forward to save the heritage at a time the Anuradhapura and Polnnaruwa came under south Indian invasions. Also those who supported King Dutugamunu, Datusena and Wijiyabahu to unite the country were Rohanu People. At a time, the Buddha Sasana faced threats, it found security in Rohana Temples. They were rohana paddy lands that provided rice to the country at times when people in Anuradhapura Kingdom faced famine and the Sinhalese fought for the freedom. Hambantota is

important as a part of the great Rohana Region. It is said that up country kingdom got salt from Hambantota saltern when the country was under Portuguese rule. Hambantota was further developed as a harbor and an urban habitat area by British. Accordingly, they built in Hambantota a Kachcheri, government departments, Schools, a Police station, a Hospital and a court and diverted Hambantota as the leading administrative town. During British era Hambantota had been divided into three areas as west Giruwapaththu, East Giruwapaththu and Magampaththu. They comprised of 72, 36 and 28 village headman divisions respectively of these three areas and Magampaththu was the biggest area in respect of the land extent.

4.6 Polonnaruwa District

No.	List of Subprojects in the Area
T-7	Second Circuit Stringing of Habarana – Valachchenai 132 kV Transmission Line 100 km

District Administrative Structure

161. The district has been divided administratively into Divisional Secretariat Divisions namely; Medirigiriya, Lankapura, Elahera, Hingurakgoda, Thamankaduwa, Dimbulagala and Welikanda. There are 295 Grama Niladari divisions in the district.

4.6.1 Physical Resources

4.6.2.1 Geography

162. Polonnaruwa district is situated in a plain valley of Mahaweli river in North Central Province in Sri Lanka and 216 km away from Colombo and further it is the main city of the district as well. Total land extent of the district is 3337.9 square kilometers. District is located between Northern latitude 7’40” – 8’21” and Eastern longitude 80’44” – 81’20” and elevation is 50-500 meters. District is being bounded to Trincomalee, Batticaloa, Ampara, Matale and Anuradhapura districts. (**Figure 19**).

Figure 19: Polonnaruwa District Map

4.6.2.2 Geology and Soil

163. As in other areas in the Dry Zone, the major soil groups in the district are Reddish Brown Earth and Low Humic Glay soils. While alluvial soils occur in the Mahaweli flood plain area, erosional remnants and rock knob plains occupy the isolated hills in the western part of the district. The Reddish Brown Earth and Low Humic Gley Soils which have greater agricultural potentials, occur in a catenary sequence in the undulating landscape of the area. While well-drained and imperfectly-drained Reddish Brown Earth occur in the convex upland and lower middle slopes respectively, Low Humic Gley soil which is poorly-drained, occur on the concave valleys. The former soil group is suitable for subsidiary food crops with irrigation during the dry season and without or with supplementary irrigation during the wet season. The latter is well suited for paddy cultivation.

4.6.2.3 Climate & rainfall

164. Water is a very scarce resource in the district because the rainfall, the major source of water is relatively low and highly seasonal. Though the average annual rainfall is 115 0 - 1800 mm, it is confined to two short rainy seasons (Maha, October-January and Yala, March-May) leaving the rest of the year relatively rainless. The rainfall is also erratic, and yearly fluctuation is very high. The high temperature throughout the year (30-32°C) increases the evapo-transpiration, further reducing the efficiency of rainfall.

4.6.2.4 Water resources (Surface Water and Ground Water)

165. Ancient people had developed means for local storage of rain water by damming streams or building embankments to retain water in natural depressions. **Table 26** shows the areas covered by inland waters in the district.

Table 26: Inland waters

AGA Division	Land areas^2	Areas under water/ km^2	%
Dimbulagala	1018.1	7.3	0.71
Elahera	372.3	-	-
Hingurakgoda	338.7	14.8	4.36
Lankapura	219.6	-	-
Medirigiriya	942.1	13.1	1.39
Thamankaduwa	558.3	10.1	1.80
Total	3449.1	45.3	1.31

166. There are 4 major reservoirs and 3 middle scale reservoirs. Also there are several minor irrigations including 62 functioning reservoirs and 62 defunct reservoirs. **Table 27** shows large scale Irrigation systems (over 800 Acre feet).

Table 27: Inland waters

Name of the Irrigation System	Capacity (Acre feet)	Amount of paddy fields feed (Acers)
Parakkrama Samudraya	109000	25000
Minneriya	110000	25000
Girithale	18800	24400
Kaudulla	104000	5436
Galamuna	-	4748

4.6.3 Ecological Resources

167. 156,224.70 ha can be seen as wildlife areas and 48,460.42 ha area is given for forest conservation in the Polonnaruwa district.

4.6.3.1 Flora

168. The natural vegetation in the district consists of four major types: Dry Mixed Evergreen Forest, Riverine Forest, Lowland Savanna (Damana) and Wet Grasslands (Villus).

169. The Dry Mixed Evergreen Forest is a secondary forest that has been developed after about 1400 AD which marked the end of a long period of early civilization. The dominant species in this type of forest are Wira (*Drypetes sepiaria*), Satin (*Chloroxylon swietenia*) Kaluwara or ebony (*Diospyros ebenum*), Milla (*Vitex pinnata*) and Halmilla (*Berrya cordifolia*). All these are highly valuable hard wood timber.

170. Riverine forest is grown on river bank of the Mahaweli Ganga and on its flood plain which is subject to seasonal inundation. The riverine forest is characterized by the presence of species such as Kumbuk (*Terminalia arjuna*), Helamba (*Mitagyna parvifolia*), and Mee (*Madhuca longifolia*).

171. Villus occurs on some lowlands of the Mahaweli Flood Plain which are subjected to seasonal inundation, and therefore, villus have very little tree growth. The villu consists of specific grass species which are adapted to the local conditions. The trees that grow around the Villus are Mara (*Samanwa saman*), Eramudu (*Erythrina spp*.) and Nebadda (*Vitex leucoxylon*). Damana grasslands are found- extensively in the northern part of System B of Mahaweli. The major species found are Madan (*Syzigium cumini*), Daw (*Anogeissus latifolia*) and Aralu (*Terminalia chebula*).

4.6.3.2. Wildlife

172. The wildlife habitat in the district includes Dry Mixed Evergreen Forest. Riverine Forest, Damana grasslands and Villus. The Dry Mixed Evergreen Forest which accounts for a large share of the wildlife habitat offers food to a wide range of animals including birds, deer, monkeys, wild boar and elephants. The riverine Forests which are mainly found along the Mahaweli Ganga is a high quality habitat. Elephants, water buffaloes, and wild boar are some common species. The grasslands both Damana and Villu are favoured by elephants. They take shelter in the adjoining forest during the day and move into the grasslands in the evening. Villus also provided nesting and feeding grounds for numerous migratory bird species.

173. Fresh water fish is another important living renewable resource in the district. Fish fauna can be found in irrigation tanks, rivers, villus, and in the flooded paddy fields. A wide range of fish species are found in the major river, Mahaweli Ganga. Villus are highly productive fishing grounds, and are excellent spawning and nursery habitats for many fish species. The common species in Villu are Tilapia, Labeo, Freshwater shark and Butter Catfish. Paddy fields also serve as large areas of open water where many fish species breed. A considerable number of small sized fish are found in this habitat.

4.6.4 Economic Development

4.6.4.1 Land Use and Agriculture

174. Majority of the community in the district engages in agriculture, animal husbandry and fishing industry. Some of them are earning an additional income through domestic productions.

4.6.4.2 Industries

175. Polonnaruwa district is not industrially developed. Only 5.61 percent of the total employed population is engaged in industries. Industries in the district are predominantly agrobased. While food, beverage and tobacco industries account for 33.6 percent of the industrially employed population, textile, wearing apparel and leather industries account for 26.2 percent. Manufacture of wood and wood products, fabricated metal products, and manufacture of non-metallic mineral products comprise 19.8, 7.33 and 2.4 percent respectively.

4.6.4.3 Infrastructure

176. Construction of international cricket stadium and modernization of a domestic airport were among the future development projects under consideration for Polonnaruwa District in the North Central Province of Sri Lanka. Bus stands were built at Polonnaruwa, Hingurakgoda and Welikanda to develop transport facilities in the district. Steps are also taken to provide drinking water in the district.

4.6.5 Social and cultural Development

4.6.5.1 Population and community

177. Total population of the district in 2012 is 406,088 and growth rate of the population is 1.6%. Population density was recorded as 118.27 per km^2. Population poverty ratio was 12.7 in 2011.Unemployment rate was 6.1in 2010.

4.6.5.2 Health &Education

178. Polonnaruwa district has 237 schools and the district shows 90.5% of literacy. Infant Death Ratio was recorded as 19.5 per thousand births in 2010 and Maternal Death ratio was 43.59 per thousand births.

4.6.4.3 *Sites of Cultural, Archaeological and Historical Significance*

179. There are many places in the district which have cultural and historical significance. Polonnaruwa district was the capital of "Rajarata" kingdom. Then it was called "Wijayarajapura". Invaders called "Chola" were the first rulers to take Polonnaruwa as the capital. In 1070, King Wijayabahu the first who repulsed the "Cholas" selected Polonnaruwa as his capital too. According to the ancient chronicles during the small period of "Chola" ruling Polonnaruwa was called as "Jananathamangalam". King Parakkramabahu the Great who became king after the King Wijayabahu the first is the most prominent ruler in Polonnaruwa. Ruling period of King Parakkramabahu the Great is the golden era of Polonnaruwa kingdom.

180. Economically and agriculturally, the country reached its peak and got the series of eulogies as the Granary of the East as rice was exported in this period. The great King developed massive irrigation systems in the country and the gigantic reservoir Parakkramasamudraya. Kalinga Maga invasion took place in 1214 and subsequently Polonnaruwa capital was totally destroyed and it was shifted to Dambadeniya.

4.7 Batticaloa District

No.	List of Subprojects in the Area
T-7	Second Circuit Stringing of Habarana – Valachchenai 132 kV Transmission Line 100 km

4.7.1 Physical Resources

4.7.1.1 *Topography, Geology and Soil*

181. Batticaloa district lies in the Eastern Province of Sri Lanka. It is bounded in the North by Verugul River and on the East by Bay of Bengal. The Southern and Western boundaries are along Ampara and Polonnaruwa districts (**Figure 20**).

182. From the total area 75 per cent is flat terrain gently rising from sea level in the East to about 100m above mean sea level in the Western part of the district. There are few high striking ridges bounding the region Westward and Southward but their elevation does not exceed 300m above mean sea level. The whole district remains included within the low and intermediate peneplain. The gently rolling topography of the flat lands is interrupted by disseminated inselberg of Precambrian rocks, which have resisted the erosion agents of the predominantly

gneissic basement rocks. The distinct topographical features of the district are the two lagoons, which traverse North-South covering an area of 169 km^2 dividing the district into two distinct areas namely, the Eastern - Sea Board and the Western Shore. The greater part of the district is constituted of Precambrian, essentially gneissic and crystalline rocks. Quaternary deposits exist mainly in the eastern boundary of the district and built up of river alluvia, sand and other littoral deposits. The main lithological types of precambrian rocks identified within the district are constituted by granitic gneisses, augen gneisses, biotite gneisses, hornblende biotite gneisses and migmattie, feldspar granite, calc-granulite or gneisses, minor marble. Foliation is the common structure in the Vijeyan series of rocks. But these are either regular or highly folded. In the South Eastern region of the district, the rock folding occurs at very close intervals giving a circular structure to the rock.

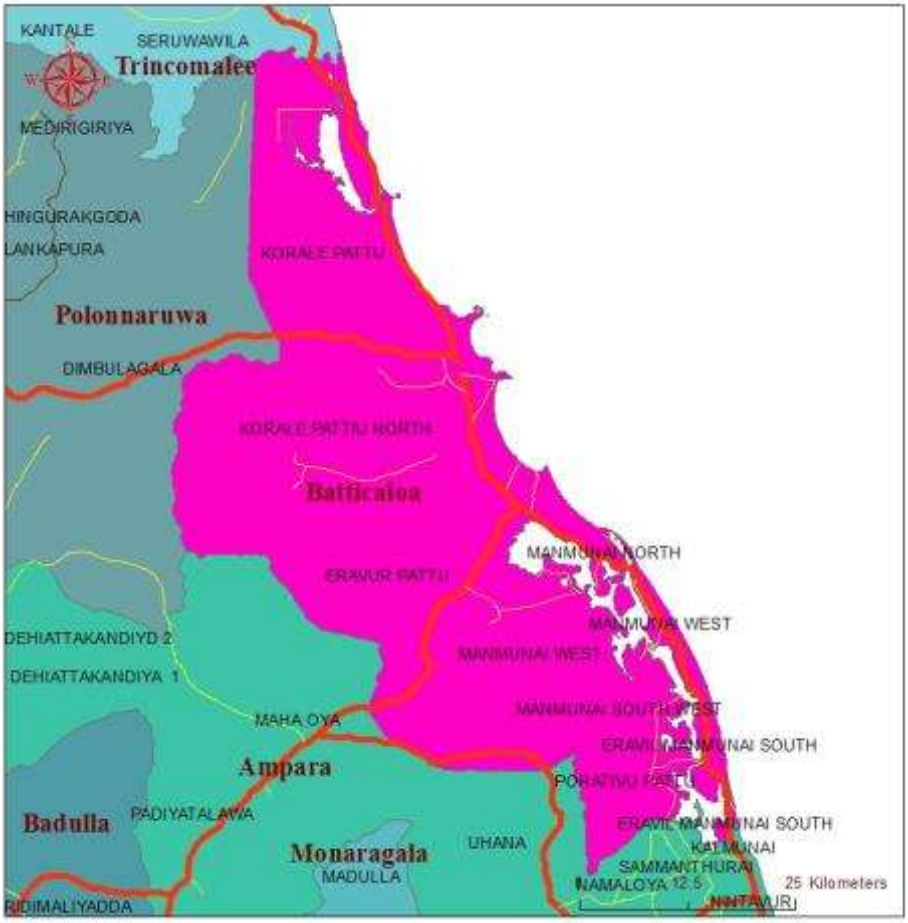


Figure 20. Batticaloa district map

4.7.1.2 *Climate*

183. Batticaloa district lies in a dry zone of Sri Lanka. Its climatic condition is influenced by the Northeast and South -West monsoons. The total annual mean rainfall is 1704 mm, concentrated between the months of November and January. The annual mean daily maximum and minimum temperatures are 30.6ºC and 24.3ºC respectively. Relative humidity ranges between 62 and 81 during the day and 76 and 83 during the night. The wind speeds vary from 9 km per hour during inter monsoons to14.3 km per hour during North East monsoons. A high-speed wind known locally as Kachchan blows from the west during the South West monsoons.

4.7.1.3 *Water Resources*

184. Water resources of the district are the rivers, lagoons, and ground water. The major rivers originate from Badulla range and meander through the district, discharging into the lagoons. There are no natural springs in the district. Water in the lagoon, "Thonas" and local depressions along the coastal belt hold saline and brackish water, which is not suitable either for irrigation or domestic use. There are 15 rivers and streams in the district of which Maduru Oya is perennial on account of the recently constructed reservoirs in the upper reach. Other rivers and streams dry up by the end of May until they are replenished by the North East monsoon. Ground water is at an average depth of 2 ½ m along the coastal belt from Neelavanai to Valaichchenai and Vakarai to Verugal. The alluvial deposits of silt clay and sand in Rugam scheme extending upto Panichakerni on the Westerrn shore of Valaicheni lagoon hold water at depths varying from 3 - 10 m. In the rest of the Western coast the aquifer is discontinuous and holds moderate to low quantity.

4.7.1.4 *Air Quality and Noise*

185. The land area laying the peneplain of Batticoloa range of hills and the Indian Ocean, with topography consisting of lagoons, paddy field and forests, the district is blessed with a clean atmosphere. The only exception is the emission of sulphur dioxide on chlorine, from the paper factory at Valaichenai, which pollutes the surrounding villages. There are complaints made to the district environmental committee of air pollution caused by the paddy hulling and chili grinding mills in most towns in the district.

4.7.2 Ecological Resources

186. Up to the early 1950's Batticaloa district had large natural forests within its boundaries. But at present total forest cover in the district is only 20.2% of the total area of the district. Major reason for decreasing of forest cover is shifting or 'chena' cultivation, extraction of firewood and illicit felling of trees for timber etc. The district has a forest cover of 53,250 ha consisting of dense forests, open forests, mangroves and forest plantations. Dense forests account for less than 50 per cent of the total forest cover. Kumbuk, Mahogony, Satin, Margosa, Halmilla, Milla, Lunumidella, Timbiri and Palu are some of the specials, which grow naturally in the forests of the district. Teak, Eucaplyptus, Acacia and Etdemata are species planted in forest plantations. In spite of the extensive deforestation that has taken place elephants still roam the jungles from the district in large herds. The population of leopards, bears, spotted deer and sambar have not declined; though they are endangered by the deforestation. Jungle fowl and countless number of birds enliven the environment. Several species of reptiles including the cobra are found all over the district. There are no Wildlife Parks in the District. But natural sanctuaries are found in irrigation reservoirs, particularly, Vakaneri, Kaddumurivu, Rukam and Puluganavi tanks. Several marine coastal areas such as the coral reef, estuaries of the 15 rivers and streams, mangroves along the banks of the lagoons and the "Thonas", beaches and Sea grass are included in the district. Most of these coastal resources are declining due to human activities such as over exploitation and excessive agro chemical usage etc.

4.7.3 Economic Development

4.7.3.1 *Land Use and the Agriculture*

187. The total area of the district is 2,854 km^2. Of these 2,610 km^2 comprise terrestrial lands

and rest 244 km^2 is covered by inland waters. The economic activities of the people of Batticaloa district are varied, depending on tradition, the area of domicile, inflow of capital and government policy on development. Agriculture plays a dominant role in the economy of the district with 30.5% of the population being engaged in it. The large extents of low-lying lands on the Western shore of lagoon are ideal for paddy cultivation. Cash crops are also cultivated extensively on banks of rivers and streams. Cashew and coconut mainly grow in the Eastern shore of the lagoon regions. Keeping cattle and poultry is extending due to grazing lands and paddy fields occurring of the area. Mainly supplying of milk to collecting centres is a popular form of employment in the rural areas. But keeping poultry on a large-scale commercial scale is very rare in the district. Fishing is popular in the district. The three lagoons and the irrigation reservoirs throughout the western shore of the district attract many for inland fishing. Though the district has a long sea belt, very few people go out fishing in the sea. People living along the sea belt, are engaged in “Madal” fishing or fishing along the coast. Deep-sea fishing is yet to develop when compared to other coastal districts, very few fishermen in the district venture out for deep sea fishing. Small-scale industries available within the districts are mat weaving, pottery, carpentry, black smithy, brick kilns, lime kilns, coir industry and cane industry etc.

4.7.4 Social and Cultural Development

4.7.4.1 *Population and Community*

188. A total of 12 DS divisions located within the Batticaloa district of eastern province and selected land for the new substation is located within Manmunai West DS Division of the district. A total of 592,997 population are distributed within the 12 DS divisions of the district. All ethnic group including Singhalese, Sri Lankan Tamil, Indian Tamil, Sri Lankan Moor and Burgher are distributed within the district. Of these majorities are Sri Lankan Tamil. Mainly four religious groups represented in the district are as follows: 2.7% Buddhist, 66.3 % Hindus, 23.9 % Muslims and 6.0 % Roman Catholics and 1.1% other Christians.

4.7.4.2 *Health and Educational Facilities*

189. A total of 28 hospitals are distributed in different locations of the district. These include a single provincial general hospital at Batticoloa, 2 base hospitals type B at Valachchanai and Kalawanchikudi, 4 district hospitals at Eravur, Kattankudy, Periya kallar and Araipattai, single peripheral unit, 3 rural hospitals, single rural hospital, single special campaign hospital, 2 central dispensaries and maternity homes and 13 central dispensaries. Altogether 309 government schools are distributed within the Batticoloa district. The literacy rate of the district is 85.9 %. The educational level of the people within the district is shown in **Table 28**.

Table 28: Educational Level of the People Distributed within the Batticaloa District

No Schooling	Attending Grade 1	Passed Grade 1-5	Passed Grade 6-10	Passed GCE(O/L)NCGE/SSC	Passed GCE(A/L) HNCE/HSC	Degree and Above	Not Started
9.7	1.6	29.4	35.7	13.8	6.7	0.5	2.5

4.7.4.3 *Archaeology*

190. Many archaeological sites dating to pre-Christian times have been found in Batticaloa district. Thus Lankavihara, Roththei (Roththa) temple, Kinnaragala, Rahathgala (Shanthamalai), Veheragalkanda (Pulukunai), eluvamulla (Pullumuilai), and Taaththon Kovil, are some sites identified and listed by the Government archaeological survey. Many towns of the area show

toponymic evidence, as well as evidence from stone inscriptions, of ancient sites related to 'Seruvavila' and other Buddhist shrines of the area. The earliest historical artefacts of the city are a Dagaba from the Ruhuna kingdom of King Kavantissa (1st century BC) as well as a Dutch fort built in the seventeenth century. In 1622, when Dutch invaded the region they built a stone fortress in Puliyantivu and has many government departments and even the District Secretariat are currently located there.

4.8 Gampaha District

No.	List of Subprojects in the Area
T-5	Construction of Biyagama 220/33 kV Grid Substation
T-3	Augmentation of Biyagama, Kotugoda Old Grid Substations

4.8.1 Physical Resources

4.8.1.1 *Topography, Geology and Soil*

Geography

191. Gampaha District is located in the west of Sri Lanka and has an area of 1,387 km^2. **Figure 21** gives the map. It is bounded by Kurunegala and Puttalam districts from north, Kegalle district from east, Colombo district from south and by the Indian Ocean from west. The borders of the district are the Maha River on the north, Kelani River on the south and 1,000 ft. contour line on the east. Gampaha district is divided into 13 Divisional Secretary's Division (DS Divisions), each headed by a Divisional Secretary. The DS Divisions are further sub-divided into 1,177 Grama Niladhari Divisions (GN Divisions). Gampaha town is the sixth largest urban area in the Western Province, after Colombo, Negombo, Kalutara, Panadura and Avissawella. Gampaha is also the second largest in Gampaha district, after Negombo city. Gampaha District is situated between Latitude 6° and 7° North and Longitudes 79° and 80° East.

Figure 21: Gampaha district map

Geology and Soil

192. Geologically Gampaha district falls within the Western Vijayan complex (Wanni complex) that is composed of the following formations: Alkalifeldspar, granite, gneiss, migmatite – non foliated to foliated late stage K-feldspar rich intrusion and melts; Hornblande biotite gneiss - massive to compositionally layered grey gneiss with quart>20%; Biotite and hornblende gneiss - medium to dark grey gneiss, plagioclase; Granite gneiss; and Charnokitic gneiss.

193. Laterite is a common cap on metamorphic rocks of the coastal zone and lateritic gravel, a pebbly and often sandy, loose, brown to reddish soil, is found both as a capping and also adjacent to the laterite. Quaternary deposits include alluvium beach rock, dune sands, marsh and lagoonal deposits, as well as coral, old beach, and shoreline deposits. Except for beach rocks crops along the shoreline, the quaternary deposits are mainly superficial and unconsolidated, resting on the eroded and uneven surface of the Proterozoic rocks. These deposits are of great importance as they form very good aquifers. The thickness of these formations is highly variable but rarely exceeds 30 m.

Geomorphology

194. The district slopes gently in a northeast direction towards the Negombo lagoon, where one of the largest wetlands in Sri Lanka, known as Muthurajawela, is located. The

Muthurajawela marsh is the largest saline coastal peat bog in Sri Lanka.

4.8.1.2 Climate

195. The Gampaha District is located in the wet zone and receives rain from both the southwest and northeast monsoons. In Gampaha, the average annual rainfall is 2,540 mm and the average annual temperature varies from 29°C to 35°C. The relative humidity average is 76% during the day and 89% during the night.

4.8.1.3 Drainage, Rivers and Irrigation

196. The drainage pattern is important as most of the industrial effluents are discharged into rivers or water bodies in Gampaha district. The area is drained principally by the Maha Oya and the Attanagalu Oya and in the extreme southeast by the Kelni Ganga. Much of the area is comprised of coastal low lands under 100 msl. The Attanagalu Oya brings significant discharges of agricultural and industrial effluent and sewage in to Muthurajawela-Negombo lagoon system. Although the Muthurajawela marsh has considerable capacity to remove excess nutrients and toxic substance, the marsh itself is under intense pressure from surrounding industries, low-cost housing along its borders, and land reclamation.

4.8.1.4 Hydrogeology

197. Groundwater in the area occurs in four main forms: Shallow sand aquifer - high yielding; Laterite -low to moderate yielding; Weathered crystalline rock - moderate to high yielding; and Crystalline deeper fracture zone (hard rock aquifers) - low yielding. High yielding wells in the shallow sand aquifer have been recorded in parts of the district. Clay content of the sand varies and a number of clay horizons are noticed among the lithological descriptions. Parts of the district is underlain by the laterite aquifer that are easily accessible using dug wells as well as shallow 'tube' wells. However, the vesicular laterite aquifer of the southwest wet zone is over exploitation in the area of Gampaha and adjacent districts. The rapid expansion of industrial estates, urban housing schemes, and bottled water projects in this area is causing a tremendous pressure on this limited resource. Enhanced nitrate levels have been observed for a number of domestic wells around Gampaha and its suburbs. The weathered area of the metamorphic hard rock is the most productive of the aquifers underlying in the district Yield analysis indicates that well yields are typically 100 to 900 l/m at depths ranging from 15 to 28 m.

4.8.2 Economic development

198. Major crops cultivated in Gampaha are paddy, coconut, rubber, vegetables, fruits and flowers. Large areas still exist under agricultural production, paddy cultivation, taking a prominent place. major fruit crops which are grown in Gampaha district are, Pineapple – 10.62 km^2 and the production is about 10,000 MT, Banana – 14.18 km^2 and the production is about 10210 MT, Rambutan – 7.97 km^2 and the production is about 6376 MT and Papaya – 0.98 km2 and the production is about 588 MT.

199. However, there are drastic trends to move out from agricultural employments in past few decades because of high input costs and lack of labour due to less interest in farmers and young generations on agricultural activities, have resulted in many owners to abandon the paddy land. Further, the recent escalation of land prices are a threat to these cultivable land, and the government has brought in strict legislature to prevent paddy land being sold for commercial construction.

4.8.2.1 *Minerals*

200. Gampaha district mainly contains sedimentary limestones, graphite bearing rocks, Feldspar, magnetite and gem occurrences.

4.8.2.2 *Industry*

201. Industrial development is concentrated in the lower part of the Attanagalu Oya catchment. Only a minor percentage of these industries have any form of wastewater treatment facilities and, when available, it is limited to primary treatment. Industrial effluents together with sewage from industrial estates are mostly discharged into the Attanagalu Oya or its tributaries. Sludge produced in the existing treatment plants is deposited in marshy low-lying areas as landfill.

4.8.2.3 *Infrastructure*

202. Bandaranaike International Airport is located in Katunayake, in the Gampaha district. It is the major airport in the Sri Lanka. It is administered by Airport and Aviation Services (Sri Lanka) Ltd. It is the hub of Sri Lankan Airlines, the national carrier of Sri Lanka.

4.8.3 Ecological Resources

4.8.3.1 *Forests*

203. Forest covers 0.5% of land area in the district (details in **Table 29**). Depletion of forests is a serious environmental problem. Most of the forest areas are sparse forest, lowland forest, and riverine dry forest. Gampaha district has a total forest cover of 7.74 km^2. Considering the total area of coastal habitats, it is divided as, Mangrove - 0.85 km^2, Salt marshes - 6.47 km2, Dunes - 0.53 km^2 and Estuaries - 32.89 km^2. Muthurajawela Marsh and Negombo Lagoon are located in the Gampaha district. Muthurajawela wetland is located at mainly sea level in the Gampaha District, Western Province, about 20-30 km. North of Colombo. It is categorized under Ramsar Wetland Sanctuary. The wetland represents a large area of brackish marshes, mangrove swamps and fresh water marshes merging into an estuarine lagoon about 32 km^2 to the northwest. The marshes cover an area of approximately 31 km^2. The lagoon opens to the sea at its northern end and receives fresh river water input from the Ja-Ela and the Dandugam Oya.

204. Muthurajawela harbors over 194 species of Flora distributed over seven major vegetation types which includes marsh, lactic flora, shrub land, reed, swamp, grasslands, stream bank and mangrove forest. A total of 194 species of vegetation belonging to 66 families have been recorded which include one endemic species (Phoenix zelanica). Among the different types of vegetation, the shrub land consists of 115 species with the mangrove forest and stream bank consisting of just 23 species each. But now, most of these species are under threats. The vertebrate fauna includes 40 species of fish, 14 species of reptiles, 102 species of birds and 22 species of mammals. Among the total vertebrate species documented 17 are endemic while 26 are nationally endangered. Among the invertebrates documented 48 species are butterflies and 22 species are dragonflies.

Table 29: Name, category and the extent of Forest Reserves in Gampaha district

Name	Category	Extent (ha)
Alawala-Ataudakanda	PR	352.8
Bajjangoda	PR	175.9
Dambukanda	PR	41.7
Halpankanda	PR	158.5
Horagolla	S	13.4
Karagahatenna	PR	55.4
Kebalawita	PR	114.9
Kotakanda	PR	242.7
Mahakanda	PR	103.0
Maimbulkande-Nittambuwa	S	21.8
Mirigamkanda	PR	139.2
Mitirigala	FR	353.7
Walbotalekanda	PR	41.7
Wilikulakanda	PR	310.0

FR- Forest Reserve, PR- Proposed forest Reserve, S- Sanctuary

4.8.3.2 *Land use*

205. About 40.1% of the district's 141,890 ha. consists of home gardens.

4.8.4 Social and Cultural Development

4.8.4.1 Population and Community

206. Gampaha District's population was 2,294,641 in 2012. The majority of the population are Sinhalese, with a minority Sri Lankan Moor and Sri Lankan Tamil population. The population density of Gampaha district is 1700/km^2. The male population representing 48.60% amounts to 1,115,349 persons. The female population accounts for 1,179,292. On a community basis, Sinhalese accounts for 2,079,115 persons. This is 90.61% of the total population of the district. Muslims accounts for 95,501 persons and Tamils accounts for 80,071 persons. In categorizing the population on the basis of religions, 1,640,166 persons are Buddhists, 114,851 belong to Islam and Hindus and Christians account for 52,221 and 486,173 respectively.

4.8.4.2 Health and Educational Facilities

207. Within the Gampaha district, one teaching hospital; Ragama, three district base hospitals; Gampaha, Negambo and Kiribathgoda, one base hospital; Wattala, four district hospitals and several rural and peripheral hospitals are present.

208. Total number of schools in Gampaha district is 539.most of them are categorized under national and secondary schools.

4.8.4.3 Sites of Cultural, Archaeological and Historical Significance

209. Before 1815, major area of Gampaha district was a dense forest. The 5th Governor of Ceylon, Sir Edward Barnes made a visit to Gampaha in 1825, on the way to observe the construction work of the Negombo-Colombo road. The British colonists built Henarathgoda railway station in 1864, which act as a key factor for the progress and recognition of the town. In 1867, the first rubber tree of Sri Lanka was planted in Henarathgoda botanic gardens.

210. Some other important cultural and historical sites located in the Gampaha district are, Attanagalle Viharaya (Temple forest garden), Varana Gal Viharaya (Rock outcrops and caves) and Maligatenna and Pilikuttuwa monasteries (Caves, forest).

4.9 Puttlam District

No.	List of Subprojects in the Area
T-8	Augmentation of Madampe 132/33 kV Grid substation

4.9.1 Physical Resources

4.9.1.1 Geography

211. Puttalam is a district situated near to the west coast of Sri Lanka (**Figure 22**). It has an area of 3,072 km^2. The district capital is Puttalam, which borders the Kala Oya and Modaragam Aru in the north, Anuradhapura District and Kurunegala District in the east, Ma Oya in the south, and the Indian Ocean in the west. Puttalam is well known for its picturesque lagoons, popular for shallow sea fishing and prawn farming activities. The town of Kalpitiya, and the Kalpitiya Peninsula, is located in this district. Local authorities of Puttalam Urban Council and Puttalam Pradeshiya Sabha and electorates of Puttalam and a small portion of Anamaduwa are included into the administrative area of Puttalam divisional secretariat. Puttalam D.S. has 86 villages within 22 Grama Niladari divisions. 16 out of 22 G.N. divisions are situated in Puttalam electorate and the rest located in Anamaduwa electorate.

4.9.1.2 *Climate*

212. Most of the district lies in the dry zone, except for the southern tip, which extends into the wet zone. Annual rainfall of the southern part of the district is in the range of 1000 mm to 1250 mm and this decreases gradually towards the north of the district. Most of the rain occurs in the Maha Season (October to January). The average daily temperature exceeds 27^o C.

Figure 22: Puttalam district map

4.9.1.3 *Topography, Geology and Soil*

Geology

213. The coastal belt zone of the project area north of Mondel is underlain by the unconsolidated Miocene sedimentary sequence while the rest of the district is underlain by Precambrian Western Vijayan complex. The main rock types within the district are described as follows:

Age	Formation
Recent	Residual soil, alluvium, colluviums, sand dunes, tidal flat sediments and blown sands
Quaternary	Laterite and laterite gravel, red and brown earth, partly consolidated sands and clay
Miocene	Limestone, sandstone and mudstone
Jurassic	Sandstone, shale and limestone
Precambrian	Precambrian Metamorphic rocks of the Vijayan complex

- Recent Deposits: Alluvial deposits are found on the flood plains of streams. Collovial deposits are generally found in the lower slopes of ridges and valley terrain. Unconsolidated sands and sand dunes occur extensively along the coast with well-developed dunes rising

above 10 m as found in the coastal belt from Udappu to Kalpitiya. These sand dunes are very important as they contain pockets of fresh water. Tidal flat deposits are confined to only a few locations in the lagoonal sediments such as the southern boundary of the Puttalam lagoon where the Kalpitiya peninsular joins the mainland. The soil mantle carpeting the entire district is composed of varying soil types, each is related to the climate and the parent geological formation.

- Quaternary Deposits: A succession of sands, clays, sandy clays, gravels, and pebble deposits of marine, littoral, and continental origin exists along the coast from Maha Oya to Modargam Aru. This succession extends inland from 1 to 3 km in the south, increasing to 5 to 13 km in the north. The western coastal belt of the district, north of Mundel is covered by the Miocene Sedimentary sequence, which extends 10 km inland and wedges over the crystalline basement rocks. The underlying Precambrian granitic rocks and the overlying quaternary sands and clays are both unconfined within the Miocene succession.
- Jurassic Sedimentary Deposits: Isolated and very small sedimentary basins have been recognized within the metamorphic terrain at Pallama, Andigama, and Tabbowa areas. These sedimentary basins of Jurassic age are not exposed and have been identified only in drill cuttings and drill cores. In the Tabbowa area, a sequence of loosely consolidated arkosic sandstones, grits, and shale with occasional limestone lenses has been identified. The sand stone is distinctly reddish and medium grained in texture.
- Precambrian Metamorphic: Rocks of the Vijayan series occupy the eastern portion covering over seventy percent of the district. These rocks are overlain by a weathered mantel beneath a thin surface soil layer. The main rock types in the Precambrian complex are granites, granite gneisses, migmatites and migmatitic gneisses and hornblende biotite gneisses with quartzites, calc gneisses, amphibolites, pegmatites, and charnockites as minor rock types. The crystalline basement rocks of the western Vijyan series in the Puttalam District appear to have been deformed more than once, as indicated by the structural features in the exposed rock faces of many rock quarries. The Precambrian basement is directly overlain by the Miocene formation in the west.

Soil

214. Two kinds of soils found in the district. The southern part contains brown colored gravel based soil and the northern part contains latasol soil. Latasol is known as the oldest soil of its kind. It was developed in an entirely different climate situation than present days. It permits easy seepage of water. It is not very nutritious except for the cultivation of Citrus family, cashew and lpil plantation.

Geomorphology

215. Aerial photos and relief maps reveal that three distinct geomorphic zones can be identified in the Puttalam District. Zone 1 is a flat coastal strip: A narrow belt forms the western boundary, having a width of 1 to 2 km in the south and widening to 8 to 12 km in the north. The elevation of the belt starts at sea level and rises to an elevation of about 20 m as one moves inland. However, close to the sea at Aruwakalu an uplifted Sri Lanka - Upgrading and Modernization of the Hydro-Meteorological Information System limestone block rising to about 6 m and parallel to the coast breaks the monotonous flatness of the belt and extends as a ridge to Kudramalai. A series of very low and rounded ridges and runnels running parallel to the coastline are also visible in a few locations. Zone 2 is undulating low ridges: An area of broadly undulating and widely set low ridges bounded by Mahaoya in the south, Maha Kumbukkadawels in the north, and Pallama in the east. These broad ridges are generally aligned in a north–south direction and are structurally disturbed by a transversal fracture system, which has developed

into fracture valleys having a general east–west alignment. Zone 3 is monadknocks and rock knobs: The eastern most area of the district comprising of monadknocks and turtle backed rock outcrops of high relief rises from 20 m to 110 m msl.

4.9.1.4 *Drainage*

216. In the coastal strip north of Puttalam, a few man-made lakes and a number of natural lakes (villus) and marshes are found. Due to the very low relief (flatness) of the area, the area drains very slow through meandering streams, villus, and marshes before entering the sea. Major streams such as the Maha Oya and Deduru Oya, which flow east to west, are located in the southern part of the district. These two streams together with their tributaries drain the area to the west. Kala Oya and Mee Oya are the major streams to the north, which originate in the dry zone and have very low flows. Depressions around the Pallama area support the formation of swamps as a result of floodwaters. The mature topography and the meandering river courses have given rise to ox-bow lakes along the Deduru Oya. The lower flood plains encompassing the subdued coastal stretch are subject to frequent flooding, especially from torrential monsoonal rains. The rural population depends on groundwater with the exception of the few perennial streams and major irrigation reservoirs in the area; all other surface water sources dry up.

4.9.2 Ecology/Biodiversity

217. Puttalam district is located in the dry and semi-arid zones of the country. It consists of around 15% of natural dry-mixed evergreen forest as of 1998 (IUCNSL and MOENR, 2007) and diverse coastal habitats. It is home to some specific fauna as well as species common throughout the dry zone of Sri Lanka. Puttalam district is a district with a considerably rich avifauna with wetland areas to where lots of migrant birds visit every year. The Annawilundawa tank sanctuary which is located within the district has been even declared as a wetland with international importance due to this reason. Chilaw coastal areas, Navadankulama tank, Puttalama salterns and Kalpitiya area are some of very popular birding localities in the district. As Puttalam district is the southernmost area in the north western semi-arid zone of the country some of the bird species which are mainly found in the Indian avifauna zone of Sri Lanka (Kotagama and Ratnavira, 2010) can also be found in Puttalama district. Some of them are Eurasian Collared Dove (*Strptopelia decaocto*), Black Drongo (*Dicrurus macrocercus*) and Grey Francolin (*Francolinus pondicerianus*). Apart from birds Puttalam is also a home to many other vertebrate species as well as invertebrates. National Redlist 2012 of Sri Lanka has stated that 27 threatened vertebrate species including 7 endemics have been recorded from the Puttalam district.

4.9.3 Economy

218. Puttalam is a business center catering to other D.S. divisions as well. Through the production of solar salt approximately 10,000 persons are employed in salt related activities. The coastal population is involved in fishing in the lagoon. Although the division is not considered as a major agricultural area, coconut plantation in the south, cashew and paddy are cultivated in northern part of the division.

219. There are no major industries specific to Puttalam. Some home based products from coconut kernel are active within the division. Micro and small level industries are found in the division. Especially a soft drink producing plant, garment factories and snack (mixture) production are well known small industries. Large level industries such as cement, salt and

gravel brick/ tile factories are situated in the district.

4.9.4 Social and Cultural Development

4.9.4.1 *Population and Community*

220. The population of the Puttalam district by 2012 amounted to 760,778. The population density of Puttalam district is 250/km^2. The male population representing 48.48% amounts to 368,860 persons. The female population accounts for 390,916. On a community basis, Sinhalese accounts for 559,031 persons. This is 73.48% of the total population of the district. Muslims accounts for 146,820 persons and Tamils accounts for 50,026 persons. In categorizing the population on the basis of religions, 328,450 persons are Buddhists, 152,280 belong to Islam and Hindus and Christians account for 28,812 and 249,006 respectively.

Internally Displaced Persons:

221. The D.S. division of Puttalam and three other neighboring D.S. divisions within the Puttalam electorate and partly Anamaduwa electorate provided refuge to the evicted Muslims from Northern Province around October 1990. The settling of these people in the said D.S. divisions created umpteen problems to the people referred to as Host community in the area. Competitions and sharing the resources available, water, land and problems in the economic activities of the Host community propped up. Even after the end of the war, the vast majority of the IDPs have opted to stay in Puttalam which create more problems to the Host community.

4.9.4.2 *Health and Educational Facilities*

Education

222. From pre-schools to Maha Vidyalaya (secondary colleges) including two National schools are functioning in this D.S. division. Among these formal educational institutions, 'President's Science College' which is the first in Sri Lanka also situated in this division. A study center of Open University of Sri Lanka and the vocational training institute which provides tertiary education with many private owned academic institutions provides educational facilities to the people in this division.

4.9.4.3 Sites of Cultural, Archaeological and Historical Significance

223. The district secretary's administrative office which is known as 'kachcheri' was constructed during the period of Dutch administration of the maritime province. This two story building with timber and the rafters and beams without joint can be seen.

224. Presentation of a trumpet and two Royal insignias of the Kandyan King Sri Veera Parakrama Narendrasinhe to the Mohideen Jumma (Grand Mosque) Masjid of Puttalam when he visited in 1720 A.D. and was very warmly received by the people of Puttalam.

- St. Clement Catholic Church situated in Puttalam – Colombo main road.
- A Catholic burial ground situated in front of the urban council administrative building.
- The house belongs to E.S.M. Cassim Marikkar family in the North road.

4.10 Colombo District

No.	List of Subprojects in the Area
T-2	Construction of Colombo B 132/11 kV Grid Substation
T-3	Augmentation of Kolonnawa Old Grid Substations
T-4	Padukka – Horana 132 kV Transmission Development 23.7 km long line
T-6	Augmentation of Dehiwala Grid Substation

4.10.1 Physical Resources

4.10.1.1 *Topography, Geology and Soil*

225. Colombo is the most highly populated district in Sri Lanka. According to the census reports in 2012 the population was 2,309,809. Colombo district is divided into 13 Divisional Secretariat Divisions and their activities are coordinated and supervised by the Colombo District Secretariat. Colombo district is a combined mixture of mountains, plains and marsh lands. north and east parts of the district are mountainous whereas east and south-east parts are surrounded by marsh lands. City of Colombo is connected by a network of canals and at the heart of the city is the Beira Lake (**Figure 23**). The boundaries of the Colombo district are North-Kelani River (Gampaha district), South-Bolgoda River (Kalutara district), West-Coast line, and East-Sabaragamuwa Province.

Figure 23: Map of Colombo District

Geology

226. Vast area (over 90%) of Sri Lanka is underlain by metamorphic crystalline rocks of Precambrian age, which includes the Colombo area, which cover a variety of Gneisses. The geology of Colombo is representative of the geology of the western coast of Sri Lanka and has existed for much of the Quaternary era. This is shown in the 1:10,000 and 1:50,000 geological maps of Colombo region produced by the Geological Survey and Mines Bureau (GSMB). The typical rock types of this basement include Biotite gneiss, Hornblende Biotite gneiss, Charnockites, Charnockitic gneisses, Quartzite and undifferentiated Meta sediments. The floodplains along Kelani River and the Kalu Ganga rivers consist mainly of alluvial deposits. The floodplains of Kelani River also provide thick alluvial profiles for unconfined aquifers, in addition to the productive overburden along tributary banks.

227. Bore holes drilled in central Colombo City show that this area once formed an estuary of the Kelani River and the Kalu Ganga River, the two main rivers that drain into the sea on the western coast. A few kilometers upstream in the inland valleys, there is a high-level gravel formation consisting of quartz pebbles embedded in a matrix of laterite separated with pebble-free layers of laterites. The floodplains along the rivers consist mainly of alluvial deposits. The floodplains of Kelani River also provide thick alluvial profiles for unconfined aquifers, in addition to the productive overburden along tributary banks.

228. According to Survey Department soil maps the main soil types and terrain in the project area are Red Yellow Podzolic soils with soft or hard laterite: undulating terrain, Bog and Half bog soils: flat terrain, Alluvial soils of variable texture and drainage: flat terrain and Regosols on recent beach sands: flat terrain.

4.10.1.2 *Geography and climate*

229. Colombo's geography is a mix of land and water. The city has many canals and, in the heart of the city, there is a 65-hectare Beira Lake. The northern and north-eastern border of the city of Colombo is formed by the Kelani River, which meets the sea in a part of the city known as the Modera (mōdara in Sinhala) which means river delta. Colombo's climate is fairly temperate all throughout the year. From March to April the temperature averages around 31°C. The only major change in the Colombo weather occurs during the monsoon seasons from May to August and October to January. Colombo sees little relative diurnal range of temperature, although this is more marked in the drier winter months, where minimum temperatures average 22°C. Rainfall in the city averages around 2,400 mm a year.

4.10.2 Economic Development

230. The majority of Sri Lankan corporations have their head offices in Colombo. Some of the industries include chemicals, textiles, glass, cement, leather goods, furniture, and jewellery. In the city centre is located South Asia's second tallest building – The World Trade Centre. The 40 story Twin Tower complex is the centre of important commercial establishments, situated in the Fort district, the city's nerve centre. Right outside the Fort area is Pettah which is derived from the Sinhalese word pita, which means out or outside as it is outside the Fort.

231. Pettah is more crowded than the fort area. Pettah's roads are always packed and pavements are full of small stalls selling products ranging from delicious sherbat to shirts. Main Street consists mostly of clothes shops and the cross roads, which are literally known as Cross

Streets where each of the five streets specializes in a specific business - First Cross Street is mostly for electronic goods shops; the Second cross street is mostly for cellular phones and fancy goods. At the end of the main street further away from Fort is the Sea Street, Sri Lanka's gold market. This mile-long street is full of jewellery shops. The Colombo Metropolitan Region (CMR) encompasses the country's administrative capital Kotte and Colombo. Found within the borders of the CMR is 80% of the country's industries and over 60% of all vehicles plying Sri Lankan roads. The per capita income of the Western Province stood at USD 3,808, making it one of the most prosperous regions in South Asia.

232. Colombo district has relatively high proportion of modern facilities such as teaching, provincial, and base hospitals while in Gampaha and Kalutara Districts these facilities are very limited. For example, there are 610 hospital beds per every 100,000 population in Colombo district, compared with 260 beds in Gampaha and 210 in Kalutara. In terms of doctors per 100,000 populations, Colombo district average is 68 while the average for Gampaha and Kalutara are 17 and 22 respectively.

4.10.3 Ecological resources

233. The forest cover in Colombo district is 1,832 ha (2.7%). This forest area includes mainly the lowland rain forest formation. In addition, several wetlands are found e.g. Muthurajawela, Bellanwila-Attidiya, and Sri J'Pura Bird Sanctuary (**Table 30**).

Table 30. Name, category and extent of forests areas in Colombo district.

Name	Category	Extent (ha)
Bellanwila-Attidiya	S	60.0
Getamarawa-Dunkolahena	PR	129.7
Indikada Mukalana	PR	747.5
Kananpella	FR	263.5
Miriyagalla	FR	123.1
Sri Jayawardenapura Bird	S	449.2
Muthurajawella	S	0.0
Labugama-Kalatuwawa (Col/Kal/Rat districts)	FR	2150.1

S- Sanctuary, FR- Forest Reserve, PR- Proposed Forest Reserve

3.5.3 Biodiversity

234. As the district with highest urbanization and population density Colombo has very little natural habitats left. Still, the remaining habitats harbour a considerable faunal diversity within them. The wetland areas such as Bellanwila-Attidiya Sanctuary, Thalangama Environmental Protection Area, Jayawardenapura marshes, Bolgoda wetlands support the existence of many species of fauna that associates wetlands. According to a recent study conducted, the Bellanwila-Attidya Sanctuary and the vicinity areas provides habitat for many animal species including 75 butterflies, 22 fish, 11 amphibians, 27 reptiles, 78 birds and 14 mammals. The mammals which has been recorded even includes threatened species such as the Fishing Cat. Many migrant birds also visit the wetlands in the Colombo district including uncommon migrants like the Glossy Ibis which is a regular visitor to both Bellanwila-Attidiya and Thalangama area. The few remaining forest patches, especially associated to the Buddhist monasteries and the sub-urban home gardens are also important in sustaining the fauna in the district. Apart from the large vertebrates Colombo district is also important in invertebrate diversity. Few nationally critically endangered dragonflies such as *Agriocnemis femina* and *Cyclogomphus gynostylus*

has been recorded from the wetlands in the district and a small marsh close to Hanwella city in Colombo district is the only known locality of the recently recorded *Archibasis oscillans hanwellanensis*. However due to the rapid on going urbanization many of the faunal species recorded from the district are under threat. The National Redlist 2012 of Sri Lanka states that 20 species of freshwater fish, 13 species of amphibians, 5 species of reptiles, 13 species of birds and 7 species of mammals recorded from the district are under the threat of extinction at the national level.

4.10.4 Social and cultural Profile

235. The Colombo Metropolitan Region, defined by the districts of Colombo, Gampaha and Kalutara, has an estimated population of 5,648,000, and covers an area of 3,694.20 km². As per the Provincial Gross Domestic Product-2010, the Western Province, which includes the cities of Colombo, Gampaha and Kalutara recorded GDP per capita of USD 3,808, the highest recorded GDP per capita for any region in South Asia. Colombo has the highest degree of infrastructure - electricity, water and transport etc. The majority of the major shopping malls in Sri Lanka are located in the city apart from that, many luxurious hotels, clubs and restaurants are situated in the city. In recent times, there's been an outpour of high rise condominiums in the city, mainly due to very high land prices.

4.10.4.1 *Population*

236. Colombo district's population was 2,309,809 in 2012 according to the census of population and housing. The ethnic composition is 76.6% Sinhalese, 12.2% Tamil, 9% Muslim and 3% others. The literacy rate of the population aged 10 years and over is 93.6% (male 94%, female 93.1%). The labour force participation rate, expressed as the percentage of employed aged 10 years and over, is 47.5%. Employment rate is 93.6% and unemployment rate is 6.4%. The people tend to be engaged in craft and craft related work, manufacturing and wholesale and retail trade. The total number of households in the district is 555,926, 86.8% are permanent houses, 11.2% are semi-permanent houses, 0.3% are improvised houses and 1.8% are not classified. Out of the occupied housing units, 71.6% are single houses, 9.2 % are flats, 6.4% are row houses/line rooms, and 1.5% are huts.

4.10.4.2 Sites of Cultural, Archaeological and Historical Significance

237. Colombo District was part of the pre-colonial Kingdom of Kotte. The district then came under Portuguese, Dutch and British control. In 1815 the British gained control of the entire island of Ceylon. They divided the island into three ethnic based administrative structures: Low Country Sinhalese, Kandyan Sinhalese and Tamil. Colombo District was part of the Low Country Sinhalese administration. In 1833, in accordance with the recommendations of the Colebrooke-Cameron Commission, the ethnic based administrative structures were unified into a single administration divided into five geographic provinces. Colombo District, together with Kalutara, Puttalam, Seven Korales (present day Kurunegala District), Three Korales, Four Korales and Lower Bulatgama (present day Kegalle District) formed the new Western Province. At the time that Ceylon gained independence, Colombo was one of the two districts located in the Western Province. Parts of the district were transferred to newly created Gampaha District in September 1978.

4.11 Kalutara District

No.	List of Subprojects in the Area
T-4	Padukka – Horana 132 kV Transmission Development 23.7 km long line

4.11.1 Physical Resources

4.11.1.1 *Topography, Geology and Soil*

238. Kalutara District is located in the south west of Sri Lanka and has an area of 1,598 km^2. (**Figure 24**) Roughly the population is calculated at 761 persons per km. It is divided into 14 Divisional Secretary's Division (DS Divisions). The DS Divisions are further sub-divided into 762 Grama Niladhari Divisions (GN Divisions). Kalutara District is bordered by the sea to the west, Ratnapura District to the East, Galle District to the South and Colombo District to the North. The capital city Kalutara is located 40 km south of Colombo. Kalutara town is of special importance as a capital to Kalutara district, where not only the main service center of the district is located but also a town of religious importance due to the location of the sacred Kalutara Bo Tree and other religious buildings.

Figure 24: Kalutara district map

4.11.1.2 *Climate*

239. Kalutara District is in the wet zone and the main characteristics of the climate are high rainfall, high temperature and high humidity throughout the year. The monsoon seasons

extending from May to August and October to January include heavy rains, slightly lower temperatures periods of lower humidity. On average, the temperatures are always high, on average, the warmest month is January, and the coolest month is September. Average temperature is about 27 °C and annual rainfall varies within 1500- 2200mm.

4.11.1.3 *Geology and Soil*

240. Red- yelllow- podzolic soils with soft or hard laterite and bog soils are recorded from Kalutara district. Generally, majority of the lands of the Kalutara district are high elevated ones. But it is estimated that 7.28 % of the total land area of the Kalutara district has been inundated during the flood occurred in June, 2008 (mainly in low lying areas). Highest percentage of flooded area covered by paddy fields (about 52.67 %) and followed by Rubber (25.34%), Home gardens (15.8%) and it can be observed that somewhere of all class A and B roads and minor road of the district have been submerged by flood water.

4.11.2 Economic development

241. The labor force participation rate expressed as the percentage of employed and unemployed persons to the population aged 10 years and over, is 44.5%. The largest share of the employed population is engaged in an elementary occupation and skilled agricultural fisheries. The employment rate is 89.7% and the unemployment rate is 10.3%.

242. The main source of income for the people is agriculture. Although paddy cultivation is practiced, the yield is extremely poor. Horticulture at the domestic level is practiced extensively. The most common fruit grown in the district is Mangostine. Toward the interior, rubber and cinnamon are grown to a large extent.

243. The total number of household in the district is 269,864. Of the total, 78.5% are permanent houses, 20.1% are semi-permanent houses, 0.4% is improvised houses and 1.0% is not classified. 72.5% of households have electricity and the remaining 27.5% use kerosene for lighting.

Minerals

244. In Kalutara district, Meegahatenna which is located in the south of Agalawatte, was one of the sites of graphite mines which produce some of the highest quality graphite in the world. High quality graphite are also found in 56 km^2 area located in Matugama in Kalutara district.

4.11.3 Ecological resources

245. Kalutara district has several types of land type as lowland rain forests, sparse forests and riverine forests. Total area of the Low land rain forests is about 140.21 km^2 and total area of the sparse forests is 45.75 km^2 (**Table 31**).

Table 31. Name, category and the extent of Forest Reserves in Kalutara district

Name	Category	Extent (ha)
Delmella Yatagampitiya	PR	1413.3
Diwalakada	PR	144.3
Haycock	FR	362.0
Ingiriya	FR	282.6

Name	Category	Extent (ha)
Kaharagala	PR	31.8
Kalugala	PR	4288.0
Kudaganga	FR	137.4
Kurana Madakada	PR	1161.4
Mahagama	FR	227.1
Meegahatenna	PR	277.4
Morapitiya-Runakanda	PR	6732.5
Neluketiya Mukalana	PR	2384.4
Pelawatta	FR	110.0
Plenda West	PR	145.3
Ranwaragalakanda	PR	192.1
Wagawatta	PR	113.0
Yagirala	FR	2390.2
Vellihallure	OSF	425.0
Boralugoda	OSF	100.0

FR- Forest Reserve, PR- Proposed Forest Reserve, OSF- Other State Forest

Rivers and streams

246. Maguru ganga starts from Dothalugala kanda in Sinharaja reservation area and from there, it joins with the Ratnapura district boundary and stretches towards the north western direction and then extends through the highest mountain rangers of the Kalutara district and pass through the Thikel Kanda, Dothalan kanda, Rusigala, Dalukgala and came along with the Halukiridola a certain extent up to the Kukulu ganga and again extends along the north western direction. Kalu ganga also has heavy water flow.

4.11.4 Social and Cultural Development

4.11.4.1 *Population*

247. Kalutara District's population was 1,217,260 in 2012. The majority of the population is Sinhalese, with a minority Sri Lankan Moor and Sri Lankan Tamil population. The population density of Kalutara district is 760/ km^2. The male population representing 48.53% amounts to 590,736 persons. The female population accounts for 626,524. On a community basis, Sinhalese accounts for 1,054,878 persons. This is 86.66% of the total population of the district. Muslims accounts for 112,276 persons and Tamils accounts for 47,973 persons. In categorizing the population on the basis of religions, 1,016,632 persons are Buddhists, 114,422 belong to Islam and Hindus and Christians account for 39,773 and 46,109 respectively.

4.11.4.2 *Health Facilities*

248. In Kalutara district, 95.3% of households have access to sanitary latrines and 84.5% of households have access to safe drinking water.

249. Within the district one general hospital is established; Kalutara / Nagoda hospital, two base hospitals are there as; Panadura and Horana, six district hospitals are there and several rural hospitals and Peripheral Units also present.

4.11.4.3 *Educational Facilities*

250. Total number of government schools in the Kalutara district is about 414 and sixteen out of this are national schools, fourteen of them are provincial schools and others are categorized under primary and secondary schools.

4.11.4.4 *Sites of Cultural, Archaeological and Historical Significance*

251. Kalutara district is endowed with a proud historical heritage. It has been reported that in the past Kalutara district had been divided into 5 divisions called Kalutara thotamuna, Panadura totamuna, Pasyodun Koralaya east, Pasyodun Koralaya west and Rigam Koralaya. According to historical documents it was identified as “Pas Yoththa”, during the period when Sri Lanka was administered under the regime of Ruhunu, Maya, Pihiti, at the time Kalutara district belonged to the Maya Rata.

252. Fa hein caves are considered as a very important historical site in the Kalutara district. The cave is important for the Late Pleistocene human skeletal remains. Radiocarbon dating indicated that the cave had been occupied from about 33,000 to 4,750 years ago. At the same time, it is mentioned that those caves are named after the Buddhist monk Fa hein.

5.0 ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

5.1 Environment Impacts and Mitigation Measures

5.1.1 Environment problems due to project location and design

253. Potential adverse environment impacts associated with transmission lines have been avoided or minimised through careful route selection. The alignment is sited away from major settlements, whenever possible, to account for future urban expansion. Forests areas and thick vegetation areas are avoided wherever possible; however route alignment passes through scrub lands, cultivated and abandoned paddy fields, rubber plantations, tea cultivations etc. Alignment in this project has avoided wetlands and geologically unstable areas, which can also pose foundation related problems. No land acquisition is required for placing transmission towers on private land. However, physical damage to the crops during the construction phase of the project will be compensated at the time of damage as per GoSL norms. Associated impacts on agricultural land will be restricted to the construction phase and will be temporary in nature. Agricultural land will be lost permanently at the base of the transmission tower. After construction, agricultural land within the transmission corridors can be used again for farming purpose.

5.1.2 Environmental Impacts Associated with Pre-Construction Stage

5.1.2.1 Acquisition of Paddy Fields and Other Lands

254. There may be loss of agricultural productivity due to obstruction and reduce the land of paddy fields. Thus following measures will have to be taken prior to the project activities:

- Avoid farming season wherever possible in the planning of project activities,
- Ensure existing irrigation facilities are maintained in working condition,
- Protect /preserve topsoil and reinstate after construction is completed,
- Repair /reinstate damaged bunds etc. after construction is completed, and
- Compensation for temporary loss in agricultural production.

5.1.2.2 Impacts on Temporary Use of Land

255. The mobilisation of construction equipment and construction materials will require space for storage and parking of construction vehicles and equipment, construction material storage yards, disposal sites, and labour camps for human resource. To avoid environmental impact and public inconvenience, these locations must comply with the local laws and regulations and need approval from authorities to utilise these facilities (access roads, telecommunication, and pipe borne water supply). It is important that selection of temporary lands is done at least 500 m away from highly populated areas, water bodies, natural flow paths, agricultural lands, important ecological habitats and residential areas. Removal of trees and green cover vegetation should be minimised during preparation of access road and other facilities.

5.1.3 Environmental Problems Associated with Construction and Operation Stage

256. The project activities during construction phase will involve clearing of trees along the route alignment wherever required, excavation for installation of towers, erection of towers, civil works related to transmission line and line stringing. For substation, it will involve excavation for

building and equipment foundations, civil works and erection of equipment. During the operation phase, most of the construction phase impacts will get stabilised and the impacts will be restricted only to the operation and maintenance of the project.

257. The impacts on the environment from various activities of the project can be categorised as follows:

- Impact on Physical Resources
  - Impact on Topography
  - Impact on Climate
- Impact on Environmental Resources
  - Impact on Air Quality
  - Impact on Noise Levels
  - Impact on Surface Water Quality
  - Impact on Groundwater Quality
  - Impact on Soils and Geology
- Impact on Ecological Resources
  - Terrestrial Ecology
  - Aquatic Ecology
  - Ornithology
- Impact on Human Environment
  - Health and Safety
  - Agriculture
  - Socio-economics
  - Resettlement and Rehabilitation
  - Cultural sites
  - Traffic and Transport
  - Interference with other utilises and traffic
- Waste Disposal
  - Solid waste disposal
  - Liquid waste disposal.

258. The impacts of the project activities on various environmental attributes are discussed in subsequent sections.

5.1.3.1 Impact on Physical Resources

Impact on Topography

259. During the construction of the transmission line and substation, the topography will change due to excavation and erection of tower, fill and cut for levelling the tower erection place. The most prominent impact on the surface topography will be due to the removing of the trees at the tower erection site and all along the Right of Way (35 m, RoW for both 132 kV and 220 kV lines as prescribed by CEB) for construction facilitation. This will lead to change in the surface features only. The impact will be irreversible as the present features along the 35 m RoW will be changed due to presence of the transmission line.

260. No topographical changes are envisaged during the operation phase of the transmission line and the substation. The existing access routes will be utilised during the operation and maintenance of the transmission lines.

Impact on Climate

261. The study area along the RoW is predominantly tea/coconut/rubber plantation/paddy plantation and home gardens in the project area. However, impact on the climate conditions from the proposed projects both during the construction and operation phases will not be significant.

5.1.3.2 Impact on Environmental Resources

Impact on Air Quality

262. During the construction phase, the activity would involve excavation for the tower erection, movement of transporting vehicles carrying the construction materials etc. along the haul road (through un-built roads, but are not maintained). At majority of locations, movement of heavy vehicles may not be possible; from approach road to construction site material will be head loaded. All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the site which although will be transitory in nature. Sprinkling of water during excavation will reduce the dust emission to a great extent.

263. The construction of transmission line and the substation will not have any negative impact on the air quality of the region during the operation phase.

Impact on Noise Levels

264. During the construction phase, the major sources of noise pollution are movement of vehicles transporting the construction material and equipment to the site. Most of the access roads along the alignment are motorable. The major work of the construction is expected to be carried out during the daytime. The noise produced during the construction will have negligible impact on the residents as the predominant land use along most part of the alignment are paddy fields/ coconut trees, tea and rubber plantations area. There will be very limited presence of population exposed to noise generated during the construction phase. The sites of subprojects are located in Pradeshiya Shaba, Urban or Municipal Council areas. The surrounding land area considered as 'Low Noise area' for Pradeshiya Sabah and 'Medium Noise area' for Urban or Municipal councils according to the Gazette Notification No.924/12, 1996 on National Environmental (noise control) regulations No. 1. Under this regulation maximum permissible noise levels for low noise area at boundaries are 55 dB(A) and 45 dB(A) for day time (06 00h – 18 00h) and night time (18 00h – 06 00h) respectively. For medium noise area these values are 63 db (A) and 50 db (A) for day time and night time, respectively. However, for construction activities in any area, the maximum permissible noise levels at boundaries are 75 dB(A) and 50dB(A) for day time (06 00h – 21 00h) and night time (2100h – 0600h) respectively.

265. Following measures will help to keep noise and vibration in acceptable level during construction phase:

- Contractor shall equip their heavy construction equipment and plants with exhaust silencers to limit the engine noise so as not to exceed 75 db (compacters, loaders, vibrators and cranes) and regularly maintain all construction vehicles and machinery that should meet the National Emission Standards.
- Contractor shall limit working time for activities that create noise only from 6.00 am to 6.00 pm except for construction site near public sensitive receptors. Construction related activities closer to sensitive receptors have to be scheduled in coordination with the relevant authorities.

- Contractor and its suppliers of construction materials should strictly implement noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinance, No 924/12 mentioned above) for all construction vehicles and equipment.

266. During the operation phase of the project, there will be corona noise from the conductors which will be felt only up to 15 to 30 m area, hence the ambient noise level meets the CEA standard for residential areas (55 dB(A) during daytime and 45 dB(A) during night time).

Impact on Surface Water Quality

267. The construction and operation of the transmission lines will not have any major impact on the surface and groundwater quality in the area. Contamination of water bodies may result due to spilling of construction materials and surface runoff from the construction site joining the water body. There may be increase in the turbidity levels temporarily where the proposed alignment is crossing and if the surface runoff during construction meets the river. This can be avoided by careful selection of the tower site and the access roads so that the surface runoff does not meet the river.

268. Proposed activities will create temporary impacts to the existing drainage system in the area including irrigation canals, natural flow paths, and also earth and line drains. Stagnation of water will also create temporary breeding sites to mosquitoes, which will have direct impact on public health. Thus incorporation of following measures will minimise anticipated impact due to obstruction of natural flow paths and existing drainage:

- Provisions of temporary drainage facilities to the particular locations if existing drains are obstructed due to construction activities.
- Maintenance of all drainage paths by avoiding blockages at all times.
- Contractor should minimise excavation of beds of any streams, irrigation systems, and other water resources available in the project affected area.
- The working area should have a specific setback buffer zone 100 m from any watercourses to avoid any pollution and impact to aquatic habitat in the area.

269. Care shall be taken to locate the temporary construction worker sheds away from the water bodies. Adequate drinking water facilities, sanitary facilities, and drainage in the temporary sheds of the construction workers should be provided to avoid the surface water pollution. Provision of adequate washing and toilet facilities should be made obligatory. This should from an integral component in the planning stage before commencement of construction activity.

Impact on Groundwater Quality

270. Groundwater pollution can take place, if chemical substances and oily waste get leached by precipitation of water and percolate to the groundwater table. For transmission line construction activity, no chemical substance or oil is used hence there is no impact on groundwater quality. The silt discharge from the earthwork around water bodies, oil, grease and fuel release from the construction vehicles/equipment and spoil from construction and other construction related activities such as raw sewerage from worker accommodation sites will mix with runoff water. This situation will increase during the rainy season and have a critical impact on surface and groundwater. Thus following measures will be required in order to prevent deterioration of water from the construction and construction related activities:

- All construction vehicles and equipment should be maintained in proper conditions without

any leakage,

- Contractors shall use silt traps and erosion control measures where the construction is carried out in close proximity to the water bodies to avoid entering of cement particles, rock, rubbles and waste water to the surrounding water bodies,
- Construction activities should be restricted to dry season,
- Waste oil should be collected properly and disposed to the approved location by Local Authorities (LA) / CEA.

Impact on Soil and Geology

271. Project activities including excavation, cut and fill operations, removal of trees and green cover vegetation etc., will enhance the soil erosion during the rainy season. Removal of trees and green cover vegetation will reduce infiltration rate of rainwater. The impact on soils will be due to the soil erosion at the tower construction site and along the access routes. Excavation activity and land clearance in the erosion prone areas have to be minimised while conducting site selection for towers. Levelling and stabilisation of tower construction sites will be done after completion of construction activity that will avoid increased acceleration of surface runoff and damage to the topsoil. The impact associated with landslides due to excessive erosion and other civil works can be avoided or minimised by following mitigation measures:

- Maximum effort should be taken to minimise removal of trees and green cover vegetation.
- Minimise obstruction or destruction to natural drainage pattern of the surrounding area.
- Proper treatment of clearing and filling areas against flow acceleration.
- Turfing work should be taken prior to rainy season around the substation.
- Contractors shall restrict cut and fill operation around sharp/deep slope areas.
- Piling activities will be restricted to non-rainy season otherwise piled materials will spread all over the area and contaminate close by water bodies.
- Top soil (2-3 cm from the top of the soil), which is removed during construction from the cultivated lands must be stored separately for future utilisation of cultivated lands near tower leg locations.

5.1.3.3 Impact on Ecological Resources

272. There is no national wildlife park, bird sanctuary, wetland in the the vicinity of the grid substations and its associated lines. The study area has sparse forest and plantations area. The ecological impacts are briefly described in the following sections.

Effect on Flora and Fauna

273. Considerable amount of trees will be removed from the project area for RoW (total 35m for both 132 kV and 220 kV (as per CEB norms) for the transmission line. None of the declared environmentally sensitive areas is located within the project-affected area. It is not expected that any flora and fauna that are rare, endangered, endemic or threatened will be affected. Migratory paths of small mammals and reptiles may be affected due to construction activities. However, noise, vibration and emission from construction vehicles, equipment will occur during construction and pre-construction stages in temporary manner. The impacts related to above activities are temporary and can be mitigated through following measures:

- Strict attention on worker force regarding disturbance to surrounding habitats, flora and fauna including hunting of animals and fishing in water bodies.
- Selection of approved locations for material storage yards and labour camps away from the environmental sensitive areas.

- Avoid entering of construction waste (cement particles, rock, rubbles and waste water) and sanitary waste to the surrounding water bodies.

Impact on Terrestrial Ecology

274. There is no sensitive ecological area/protected forest area such as national wildlife park, or bird sanctuary crossing the proposed route alignment. The removal of herbaceous vegetation from the soil and loosening of the top soil generally causes soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the construction phase and would be minimised through adoption of mitigation measures like paving and surface treatment and water sprinkling.

Elephant migration routes

275. The proposed Hambotota GSS does not hinder the elephant movements in the area as the rest of the area (north of the GSS) considered as elephant habitat, having natural vegetation (scrublands) also has scarce manmade structures (houses, roads, buildings etc.). Therefore, the impact on movements of elephants due to the construction of GSS would be negligible. The development activities in the area such as construction of an airport (zone AA), buildings and roads (zone CBD) would fragment the existing natural habitats and affects habitat's stability and health. Development activities that convert additional elephant habitats into human dominated landscapes can be expected to further increase the level of human-elephant conflict in this area, as well as surrounding areas. Human-elephant conflict is prevalent over most of the Greater Hambantota Development Area area. However, the impact on individuals and populations of terrestrial flora and fauna found in all the habitats in the Hambantota Development area would be minimal as these comprise common species with very low endemic with fewer being regarded as threatened.

276. The reconnisance survey of habitats in Greater Hambantota Development Area revealed that all habitats were subjected to different types of disturbances in the past, and the most common habitat types were agricultural lands/ paddy fields and home gardens. Therefore, undisturbed pristine natural habitats could not be found within the area except in some part of Bundala National Park and Madunagala Sanctuary. Plant and animal species diversity is low in existing forest and scrubland habitats. Species endemism is very low in the dry and semi-arid zones of the country.

277. As a mitigation measure, it is proposed to erect an electric fence surrounding the premises of the GSS to the safety of equipment as well as elephants.

Removal of Trees

278. The project may require some fruit/non-fruit trees to be removed during the construction activities. **Table 32** gives the list of trees to be felled for Tranche 2 subprojects. Approximately 370 forest trees and 6,133 fruit/nonfruit/plantation trees will be removed from the RoW of the transmission line. These would include shading timber, plantation species as well as edible fruit species. The initial construction works along the alignment involving land clearance, cutting, filling, and levelling may cause loss of vegetation. This will be irreversible impact. Care has been taken to avoid the thick plantations/vegetation as far as possible and tower locations are selected at plain paddy fields where the vegetation is thin. This will minimise the tree loss.

In Sri Lanka, normally, for compensatory reforestation or afforestation program if the line goes through a forest area where trees have to be cut, the Forest Department make an inventory of trees to be cut and the area devoid of trees. CEB is then required to fund the reforestation program in the nearby area (or they might already have reforestation program prepared for the district) which is roughly $ 2000 per ha. The Hambantota - Polpitiya Transmission line will have afforestation cost (1:1 basis of replacement cost) on account of 7910 m length of line in forest where trees are required to be cut. Approximately 27,7 Hectares (ROW = 35 m) @ 0.5 million LKR = 13.85 million LKR (US$ 0.95 million) on account of afforestation costs will be incurred in the project.

279. Compensation will be paid to the tree owners in the private areas as per GoSL norms. In home gardens, if trees have to be removed the CEB pay compensation to the owner. For example, if a coconut tree has to be cut and it produces a good yield then the maximum SLR 55,000 (c. $ 425) is paid to the owner. This amount was calculated by Coconut Development Board. If a coconut seedling is uprooted for the line the compensation is SLR 1000 only. For timber trees e.g. Jak, Mahogany, Sapu, Lunumidella, Mango, the amount to be paid is decided by the Divisional Secretary or Grama Niladhari. The amount varies according to the tree species, height and diameter, quality of the tree etc. They normally take market value of the tree.

Table 32: Total Number of Trees to be felled for Tranche 2 subprojects

Sub-Project	Details	Private Land		Forest Land
		Total number of fruit trees to be felled	**Total number of Non fruit trees to be felled**	**Total number of forest trees to be felled**
T-1	New Polpitiya-Hambantota 220 kV Transmission Development	Coconut 1124, Mango 13, Duriyan 4, Jak 111, Del- 9	Teak 1027, Rubber 589, Other trees 2142	370
T-2	Construction of Colombo B 132/11 kV Grid Substation	None	None	None
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations	None	None	None
T-4	Padukka – Horana 132 kV Transmission Development	Coconut – 256, Areca nut – 135, Jak – 9, Kottamba – 14, Kithul – 5, Rambutan- 3, Oil palm – 12,	680	None
T-5	Construction of Biyagama 220/33 kV Grid Substation	None	None	None
T-6	Augmentation of Dehiwala Grid Substation	None	None	None
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line	None	None	None
T-8	Augmentation of Madampe	None	None	None

Sub-Project	Details	Private Land		Forest Land
		Total number of fruit trees to be felled	Total number of Non fruit trees to be felled	Total number of forest trees to be felled
	132/33 kV Grid substation			

For some of the transmission line and substation sub-projects, the substation specific topography survey and the transmission line route survey works are underway. The data regarding soil, topography, contour, land cutting and filling required, distance from water body and distance from major roads, details of forest/non-forest, fruit/non-fruit trees can be being affected, land details are being collected by CEB. If sites are changed other than those indicated here, supplementary information will be supplied for each of these subprojects by CEB to ADB for prior approval before contract award.

Effect on Local Road Network

280. Transformers, tower material, substation equipment, iron bars, concrete materials, equipment etc. will be transported through the provincial and local road network to the project site. Transporting of large quantities of materials using heavy vehicles could exceed the carrying capacity of the road. This would lead to physical damages to local road network. Thus, it will be necessary to obtain consent from Road Development Authority (RDA) or Provincial Road Development Authority (PRDA) to use local roads prior to transportation. In addition, contractor should properly maintain all road sections, which will be utilised for the construction related activities.

Disposal of Debris

281. Because of construction related activities, spoil and debris will generate during the construction stage. Improper disposal of the debris will have an impact on the surrounding ecology, public health, and scenic beauty. Following measures will minimise the impacts associated with disposal of debris:

- Spoil materials (soil, sand, rock etc.) generated from construction activities shall be used wherever possible for site levelling, back - filling etc. Dismantled and demolished structural materials should not be dumped at agricultural lands.
- Dumped materials could interfere with the drainage pattern of the area, any water bodies, agricultural lands, marshlands and down slope or any environmental sensitive area and therefore must be handled properly.

282. During operation phase, corridor along the alignment will be chopped of vegetation and lopping of trees will be done for maintenance purpose. This will also reduce the chances of fires due to electric sparks.

Impact on Aquatic Ecology

283. No significant impacts on aquatic ecology of the river are envisaged, as there will be careful selection of the tower sites near the river, to avoid river pollution and disturbance to the aquatic fauna of the area.

Ornithology

284. For the proposed GSS's and two transmission line routes, there are no sanctuaries or national parks designated for birdlife at these locations.

5.1.3.4 Impact on Human Environment

Health and Safety

285. Health and safety impacts will be in terms of risk of accidents and exposure to electromagnetic fields along the alignment. The accidents may be caused due to electrocution, lightening, fires and explosions. To avoid this, houses will be allowed within the RoW of the project, only if the stipulated safety clearance specified within CEB norms is met with (specified in **Annexure 1**). Necessary training regarding safety aspects to the personnel working at the line will be provided by the contractor. Personal protective equipment like safety gloves, helmet, mufflers etc. will be provided during construction period and during the maintenance work. First aid facilities will be made available with the labour gangs and doctors called in from nearby towns when necessary. Workers are also covered by the statutory workmen compensation as per GoSL laws by the contractor.

286. Project activities may create accidental damage to public and the construction workers. Therefore, contractors should take necessary action to enhance personal safety during the construction through following measures:

- Organise awareness programmes relevant to personal safety of the workers and public in the area.
- Installation of warning signs to particular locations such as transverse points of local road network by transmission lines.
- Provide protective safety belts, footwear, helmets, goggles, eye-shields, and clothes to workers depending on their duty.
- Arrangement of proper first aid unit and transport facilities to take injured people to the hospitals.
- Follow World Bank EHS Guideline for Electric Power Transmission and Distribution.

Agriculture

287. Permanent and temporary loss of agricultural land occurs due to tower location in the agricultural field and loss of crop for access route etc. There will not be any land acquisition for the tower erection. As far as possible, any prime agricultural land will be avoided and the construction will be done after crop harvesting.

Socio-Economics

288. Construction of transmission line will generate local employment, as number of unskilled labours (men/women) will be required at the time of construction activities. Local employment during this period will increase the income and socio-economic standards of the residents of the project area.

Temporary Outage of the Electricity

289. Temporary disconnection of power supply will occur during the construction activities. Thus public and the industrial places, which are located in project-affected area, will face inconvenience for short periods. The following measures will have to be taken:

- Advance notice to the public about the time and the duration of the utility disruption, and
- Restore the utilities immediately to overcome public inconvenience.

Resettlement and Rehabilitation

290. For the construction of GSS at Hambantota approx. 10 acres land will be required from an adjoining government land whereas the other augmentation sub-projects are being planned on CEB or government lands where acquisition of land will not be required from the surrounding communities. Overall, all the lands proposed for the project are vacant and there is no physical resettlement and rehabilitation involved in the project.

Cultural Sites

291. There are no archaeological, historical, or cultural important sites along the route alignment; and hence, the impacts on these sites are not envisaged.

Traffic and Transport

292. During the construction phase, traffic disturbance needs to be minimised by avoiding high-density areas, using proper traffic signs, ensuring proper access roads and avoiding road blockage.

Interference with Other Utilities and Traffic

293. As per regulations enacted by GoSL, it is mandatory for CEB to seek clearance prior to construction from railways, telecommunications and wherever necessary from aviation authorities that are likely to be affected by the construction of transmission lines. The transmission lines affect nearby telecommunication circuits by causing electrical interference and induced voltage, which may occur to nearby telecom circuit and suggested necessary protection measures will need to be adopted. This may require measures like rerouting of the telecom circuits, conversion of overhead telecom circuits into cables etc. to minimise the interference. The exact cost to mitigate the impacts of induction in neighbouring telecom circuits would vary from case to case. Wherever transmission line crosses the railways, clearance is taken from that department. In general, the system is planned and executed in such a way that adequate clearance is maintained between transmission lines on the one hand, and railways, civil aviation and defence installations on the other. Wherever the transmission lines passes near the airport, the towers beyond specified height are painted in alternate orange and white stripes for easy visibility and warning lights are placed on the top of these towers.

5.1.3.5 Waste Disposal

Solid Waste Disposal

294. The solid waste generation will be at the location of the tower erection site which will include metal scraps, wooden packing material etc. Wooden waste and metal scrap will be collected and disposed of offsite in compliance with applicable regulations and rules.

Sanitary Waste Disposal at Construction Sites and Labour Camps

295. The labour camps at the site of tower erection will be temporary in nature and the human excreta will not be significant to cause contamination of groundwater. Those places where most labour will be staying will be near hamlets, which shall use the community services for solid waste, water and sanitation. Adequate drinking water facilities, sanitary facilities, and drainage

in the temporary sheds of the construction workers should be provided to avoid the surface water pollution. Provision of adequate washing and toilet facilities by the contractor to the workers should be made obligatory. This should from an integral component in the planning stage before commencement of construction activity.

296. There should be proper solid waste disposal procedure to enhance sanitation of workers who stay in camps. Thus, possibilities of infecting water borne diseases or vector borne diseases (Parasitic infections) will be eliminated by adopting proper solid waste disposal procedure. Unacceptable solid waste disposal practices such as open dumping of solid waste and poor sanitation facilities will lead to pollution of surrounding environment, contamination of water bodies and increase adverse impact to the aquatic; terrestrial lives and general public inhabited in the area. Surrounding of labour camps, garbage disposal sites and material storage yards provide favourable habitats for vectors of diseases such as mosquitoes, rats and flies.

297. Thus following measures are needed to protect and enhance the quality of environment during the construction stage:

- A better way to overcome garbage disposal as mentioned above is by reducing or avoiding the construction of labour camps, thus the selection of majority of skilled and unskilled workers from the project influence area will be a proper measure in this regard.
- Contractor should provide adequate facilities to manage its wastes in accordance with the guidance given by the CEA.
- Provision of the solid waste disposal, sanitation, and sewage facilities at all sites of the construction/labour camps to avoid or minimise health hazards and environmental pollution.
- Contractor should handle and manage waste generated from the construction/labour camps without contamination to natural environment and it will reduce risk to public who stay close to sites. In addition, contractor should be responsible to enhance the quality of environment.
- Adequate supply of water should be provided to the urinals, toilets, and washrooms of the workers' accommodation.
- Contractor should provide garbage bins to all workers' accommodation and construction sites, for dumping wastes regularly in a hygienic manner with the help of Public Health Inspector (PHI) in the area.
- These camps should have a specific setback buffer zone of 100 m from any watercourses to avoid any pollution and impact to aquatic habitat in the area.

Liquid Waste Disposal

298. There will be no oil or chemical waste generated during the construction of transmission line, hence no mitigation is required.

5.1.4 Environmental impacts associated with operational stage

Electric shock

299. This may lead to death or injury to the workers and public in the area. This can be minimised or avoided by:

- Security fences around substation.
- Establishment of warning signs.
- Careful design using appropriate technologies to minimise hazards.

Noise Generation

300. Nuisance to the community around the site can occur during the project implementation stage. Provision of appropriate noise barriers will be essential in this regard.

Maintenance of Transmission Line and Substation

301. Possible exposure to electromagnetic interference could occur during these activities. Design of transmission line should comply with the limits of electromagnetic interference from overhead power lines.

Oil Spillage

302. Contamination of water on land/nearby water bodies by the transformer oil can occur during operation due to leakage or accident. Substation transformers are normally located within secure and impervious areas with a storage capacity of 110% spare oil. All chemicals, oils, and fuels to be kept in bunded area of 110% volume and plant refuelling away from watercourses. Also proper drainage facilities will be constructed during the construction stage to avoid overflow or contamination with natural flow paths especially during the rainy season.

Sulphur Hexa fluoride (SF_6) Leakage

303. SF_6 is a non-toxic greenhouse gas used as a dielectric in circuit breakers, switch gear, and other electrical equipment. Very high grade sealing system and erection methodology is followed to keep the loss of SF_6 within 0.1% every year. SF_6 handling is part of each contract technical specifications, and required design and routine test are done after manufacturing of the circuit breaker and gas insulated switchgear. SF_6 gas handling system for evacuation and storage is always used for the maintenance of the circuit breaker and gas insulated switchgear. SF_6 gas leakage records will be maintained in each substation. This allows tracking of any release of SF_6 gas to the atmosphere.

6.0 ANALYSIS OF ALTERNATIVES

6.1 CEB'S Approach for Route Selection

304. At the planning stage itself, one of the factors that govern the establishment of the transmission sub-projects is the infringement of populated/forest/cultivated area and scarce land. Wherever such infringements are substantial, different alternative options are to be considered. During route alignment, all possible efforts are made to avoid the populated/forest/cultivated area infringement completely or to keep it to the barest minimum. Whenever it becomes unavoidable due to the geographical locations/terrain, mitigation costs involved towards avoidance needs to be worked out. While identifying the transmission system for a generation project or as a part of distribution grid, preliminary route selection is done by CEB based on the interpretation and walk over surveys according to the 1:50,000 maps/topographical maps of the area.

305. For selection of optimum route, the following points are taken into consideration:

(i) The route of the proposed transmission lines/substation does not adversely affect any human habitation
(ii) Any monument of cultural or historical importance is not affected by the route of the transmission line or substation location
(iii) The proposed route of transmission line/location of substationdoes not create any threat to the survival of any ethnic community
(iv) The proposed route of transmission line/location of substationdoes not affect any public utility services like playgrounds, schools, other establishments etc.
(v) The line route does not pass through any sanctuaries, protected park etc.
(vi) The line route/substations does not infringe with area of natural resources.

6.2 Alternatives for Subproject Components

6.2.1 Grid Substations

1. For selection of appropriate site for substation, the following points are taken into consideration:

i) Site selection should consider seismicity and geography of the local area; the area should not be prone to landslide or be unstable.
ii) Construction activities do not adversely affect the population living near the proposed substations and does not create any threat to the survival of any community with special reference to tribal community etc.
iii) The location of substation does not affect any monument of cultural or historical importance.
iv) No resettlement of households by the substation site, no loss of livelihoods, siting of transformers away from schools, hospitals and other sensitive receptors, with due consultation with the community and local government units concerned.
v) Transformers and other equipment specifications compliant with GoI rules/regulations & International Electro-technical Commission (IEC) standards shall be followed.
vi) Construction techniques and machinery selection shall be made with a view to minimize ground disturbance.
vii) While planning for substations, drainage lines shall also be marked and studied to avoid seepage/leakages and pollution of water sources and springs etc.
viii) Substation location/design to ensure that noise will not be a nuisance to neighbouring

properties. Provision of noise barriers near substation sites will be made.

ix) Substation design will comply with the limits of electromagnetic interference within floor area. Security fences will be erected around substations. Warning signs shall be displayed.

x) CEB shall adopt good practices and shall always strive for a high standard of house-keeping for its substations and ancillary facilities.

xi) CEB shall incorporate the best technical practices to deal with environmental issues in its working.

xii) Design of substations shall include modern fire control systems/firewalls. Fire-fighting equipment should be located close to transformers, switchgears etc.

6.2.2 Transmission Lines

306. CEB usually undertakes route selection for transmission line in close consultation with representatives from Divisional Secretaries, Ministry of Land, Agrarian Service Department, Department of Survey, Forest Department, and the local community. Although under National law, CEB has the right of way, yet it considers alternative alignments during site selection, with minor alterations often added to avoid environmentally sensitive areas and settlements at the implementation stage.

- As a principle, alignments are generally cited at-least 500 m away from major towns, whenever possible, to account for future urban expansion and at-least 50 m away from any houses or structures.
- Similarly, plantations/forests are avoided to the maximum extent possible. When it is not possible, a route is selected in consultation with the Divisional Secretaries that causes minimum damage to existing plantation/forest resources.
- Alignments are selected to avoid wetlands and unstable areas for both financial and environmental reasons.
- In addition, care is also taken to avoid/minimise protected parks/forests, bird sanctuaries and any other forest area rich in wild life.

307. Keeping above in mind, CEB officials have selected the most optimum option which can be taken up for detailed survey and assessment of environmental and social impacts for their proper management. **Annexure 2** gives the alternative analysis for the GSSs and the **Annexure 3** gives the details of the transmission line that is being reconstructed in the subproject. **Annexure 4** gives the inventorisation along the transmission line along with photographs of the RoW and terminating GSSs. **Table 33** gives the summary of the final evaluation of the site selection.

Table 33: Summary of final alternative taken for Project Consideration

SN	Project Component	Alternative Chosen	Reason
T-1	New Polpitiya-Hambantota 220 kV Transmission Development	The line via Maliboda, Erathna, Sapugaskanda, Rassagala, Balangoda, Weligepola, UdaWalawa, Embiliptiya, Sooriyawewa, Hambantota	To avoid the line through Peak Wilderness Sanctuary, Uda Walawe National Park, and to avoid the home gardens, villages and urban areas as much as possible
T-2	Construction of Colombo B 132/11 kV Grid Substation	Existing Grid Substation	

SN	Project Component	Alternative Chosen	Reason
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations	Existing Grid Substation	
T-4	Padukka – Horana 132 kV Transmission Development	The proposed alternative traverses mainly via paddy fields	To avoid the home gardens, villages and urban areas as much as possible
T-5	Construction of Biyagama 220/33 kV Grid Substation	Existing Grid Substation	
T-6	Augmentation of Dehiwala Grid Substation	Existing Grid Substation	
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line	Existing 132 kV transmission line with one circuit	The line already exists
T-8	Augmentation of Madampe 132/33 kV Grid substation	Existing Grid Substation	

For some of the transmission line and substation sub-projects, the substation specific topography survey and the transmission line route survey works are underway. The data regarding soil, topography, contour, land cutting and filling required, distance from water body and distance from major roads, details of forest/non-forest, fruit/non-fruit trees can be affected, land details are being collected by CEB. If sites are changed other than those indicated here, supplementary information will be supplied for each of these subprojects by CEB to ADB for prior approval before contract award.

2. For some of the proposed sub-projects, CEB is in the process of collecting additional information and has taken up detailed survey. These alternative transmission line alignments and substation sites will be studied by the CEB officials in detail for least techno-economic costs and least environment and social impacts before they are proposed to ADB for funding under Tranche 2.

6.2.3 Reasons for the final selection

308. Considering the various reasons based on information in the **Annexures 2, 3,** and **4** the alternative selected were found to be most suitable as they involved lesser populated area, plantation/forest areas, and minimum RoW problems.

6.2.4 Distance from Sensitive Receptors

309. Distance from various receptors is give in **Table 34** below:

Table 34: Approximate distance of Tranche-2 subprojects from sensitive receptors

SNo.	Name of Subproject	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Metal access path to the Site
T-1	New Polpitiya-Hambantota 220 kV Transmission Development	None	None	Sri Purwaramaya, Karawilayaya 100m to AP 119-120		Balangoda District Hospital (0.75 km)	Maliboda road AP 22-23 Malwala-Siripagama Road AP 41-42 A4 road AP 80-81 Karadiyamulla road AP 82-83 Wikiliya road AP 91-92 Weligepola-Handagiriya road AP 98-99

						Hatangala road AP 106-107 B427 road AP 131-132 Embilipitiya –Moraketiya road AP 140-141 Sooriyawewa-Padalangala road 159-160 B562 road 171-172 Erathna – Deraniyagala road 32-33 Adavikanda- Guruluwana road 35-36
T-2	Construction of Colombo B 132/11 kV Grid Substation	None	None			Existing substation in Pettah, Colombo
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations	None	None			Existing substations in Biyagama, Kotugoda and Kolonnawa
T-4	Padukka – Horana 132 kV Transmission Development	None	None	Sri Sammath aramaya near AP3-4, 450 m		Meegoda – Artigala Road AP 9-10 Colombo- Avissawella Road AP 11-12 Padukka- Godagama Road AP 14-15,16- 17, 22- 23 Galagedara –Horana Road AP24-25 Poruwadanda- Hadapangoda Road AP 38-39 Horana – Ratnapura Road AP 52-53
T-5	Construction of Biyagama 220/33 kV Grid Substation	None	None			Existing substation
T-6	Augmentation of Dehiwala Grid Substation	None	None			Existing substation
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line	None	None			Ambepussa- Kurunegala-Trincomalee road A6 Habarana- Polonnaruwa road A11, Hathareskotuwa- Minneriya road, Minneriya- Higurakgoda road, Polonnaruwa- Batticaloa road, A11
T-8	Augmentation of Madampe 132/33 kV Grid substation	None	None			Existing substations

For some of the transmission line and substation sub-projects, the substation specific topography survey and the transmission line route survey works are underway. The data regarding soil, topography, contour, land cutting and filling required, distance from water body and distance from major roads, details of forest/non-forest, fruit/non-fruit trees can be affected, land details are being collected by CEB. If sites are changed other than those indicated here, supplementary information will be supplied for each of these subprojects by CEB to ADB for prior approval before contract award.

310. Total land requirement for Tranche 2 subprojects is given in **Table 35** below:

Table 35: Total land* required for Tranche 2 subprojects

SNo.	Project	Total Land Area	Private Land	Government/Forest land
T-1	New Polpitiya-Hambantota 220 kV Transmission Development	89.1 ha (forest/ scrublands in RoW) 4.12 ha for angle towers (15x15m), 2.78 ha for suspension towers (12x12 m)	79.76 ha home gardens 285.67 ha agricultural lands in RoW	Govt./ CEB land, Mahaweli Authority land for substations
T-2	Construction of Colombo B 132/11 kV Grid Substation, Pettah	0.2 ha	None	Existing substation- Govt./CEB land
	Construction of Colombo C 132/11 kV Grid Substation, Kotahena	0.75 ha	None	Existing substation- Govt./CEB land
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations	Biyagama GSS- 5 ha Kotugoda GSS-3.5 ha Kolonnawa GSS- 25 ha	None	Existing substations- Govt./CEB land
T-4	Padukka – Horana 132 kV Transmission Development	Padukka GSS- 4 ha Horana GSS – 2.5 ha 1.26ha for angle towers (15x15m), 0.24 ha for suspension towers (12x12 m)	60.36 ha paddy fields in RoW 0.56 ha home gardens in RoW	Govt./ CEB land for existing substations
T-5	Construction of Biyagama 220/33 kV Grid Substation	5 ha	None	Existing substation- Govt./CEB land
T-6	Augmentation of Dehiwala Grid Substation	0.4 ha	None	Existing substation- Govt./CEB land
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line	Habarana GSS 5 ha Valachchenai GSS land 8 ha	None	Govt./ CEB lands for substations
T-8	Augmentation of Madampe 132/33 kV Grid substation	1 ha	None	Existing substation- Govt./CEB land

For some of the transmission line and substation sub-projects, the substation specific topography survey and the

transmission line route survey works are underway. The data regarding soil, topography, contour, land cutting and filling required, distance from water body and distance from major roads, details of forest/non-forest, fruit/non-fruit trees can be affected, land details are being collected by CEB. If sites are changed other than those indicated here, supplementary information will be supplied for each of these subprojects by CEB to ADB for prior approval before contract award.

6.2.5 Reserve Forest/Protected Areas/National Park/Sanctuary

311. The nearest protected areas in the transmission development component are Peak Wilderness Sanctuary, Gilimale Forest Reserve, Bamabarabotuwa Forest Reserve, Udawalawe National Park, Madunagala Sanctuary, Minneriya National Park, Flood Plain National Park, Minneriya-Giritale Sanctuary and Polonnaruwa Sanctuary. The distance from the transmission lines to the protected areas are given in the **Table 36**.

Table 36: Distance from National Parks, Sanctuaries and Forest reserves (Protected Areas) for all Tranche 2 subprojects

SNo	Sub-Project	Nearest Aerial Distance	Protected Area	Designated For	IUCN Category*
T-1	New Polpitiya-Hambantota 144 km 220 kV Transmission Development	0.8 km 0.8 km 3.5 km South 600 m East 100 m South west	Peak Wilderness Sanctuary Gilimale Forest Reserve Bambarabotuwa Forest Reserve UdaWalawa National Park Madunagala Sanctuary	Conservation of fauna and flora	Less than VI
T-2	Construction of Colombo B & C 132/11 kV Grid Substation		None		
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations		None		
T-4	Padukka – Horana 23 km 132 kV Transmission Development	8.7 km	Labugama-Kalatuwawa Forest Reserve	Catchment protection, Conservation of lowland rain forest	Less than VI
T-5	Construction of Biyagama 220/33 kV Grid Substation		None		
T-6	Augmentation of Dehiwala Grid Substation		None		
T-7	Second Circuit	Inside the park	Minneriya National	Conservation	Less than

SNo	Sub-Project	Nearest Aerial Distance	Protected Area	Designated For	IUCN Category*
	Stringing of Habarana – Valachchenai100 km 132 kV Transmission Line	(c. 7 km) 5.6 km 3.8 km Inside the park (c. 2 km)	Park Minneriya- Giritale Sanctuary Polonnaruwa Sanctuary Flood Plain National Park	of fauna and flora in the dry zone, catchment protection	VI
T-8	Augmentation of Madampe 132/33 kV Grid substation		None		

* IUCN protected area categories are categories used to classify protected areas in a system developed by the International Union for the Conservation of Nature (IUCN).

7.0 INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

312. In line with National Environmental Act (2002) in Sri Lanka, public consultation and information disclosure will be undertaken through public notice prior to the approval by CEA for the particular project. According to ADB SPS 2009, public consultation and information disclosure is to be made during the initial stages by the client itself. This activity supports the view to understand the public's perception of the project and respond to their concerns and suggestions during the early stages of the project design. Incorporation on the environmental concerns to the decision making process through the public consultation will avoid or minimise conflict situation during the implementation process.

313. Public consultations were conducted in project-affected area between March to May 2016. The community aired their opinions freely on the project, its impact, and suggestions for mitigating adverse impacts. People participated in voluntary public consultation sessions to express their views about the proposed project. Comments from all community member including women, and any disadvantaged groups, if encountered, were encouraged to participate. **Table 37** indicates a summary of public consultations conducted during the field survey. The transcript of these discussions will help CEB and the EPC contractor conduct a proper needs assessment to ensure the issues raised by people are addressed appropriately.

Table 37: Public Consultation

SNo	Name of the Component /Site	Name of the Village, Gramasevaka Division, District, Province	Distance from Project Location	Names of the Participants
T-1	New Polpitiya-Hambantota 144 km 220 kV Transmission Development	**Name of the villages:** i) Pitakanda; ii) Polpitiya; iii) Andawikanda; iv) Polwatta; v) Uwalla; vi) Mikiliya; vii) Galpaya; viii) Simon Place; ix) Hathporuwa; x) Viharagala D9; xi) Hasthipura **Name of the GNDs:** i) Minuwandeniya 318C; ii) Polpitiya 318C; iii)161B Andawikanda; iv)162A Thudawa; v) Raassagala 265; vi) Haldorathanna 261; vii) Galpaya; viii) Raththarawwa 224; ix) Hathporuwa; x) Viharagala 106; xi) 110 Namadagaswewa **Name of the DS Divisions:** i) Ambagamuwa (Ginigathhena) ii) Ambagamuwa; iii) Kuruwita; iv) Ratnapura; v) Balangoda; vi) Waligepola; vii) Embilipitiya; viii) Sooriyawewa	0.5 km to 1.2 km	W.G. Siripala, W.G. Gunawardhana W.G. DarmasiriW.G. Chamil Nandana, H.K. Jayarathna, Ms. T.G. Imeka, Ms. H.K. Podi Nona, Ms. W.G. Leelawathi, Ms. R.K.D. Damayanthi, W.A. Karunarathna, Ms. W.A. Niluka Hemamali, Ms. W.G. Dingirimenike, Ms. H.Y. Chandralatha, P.Y. Nawarathna, G.W. Kusumarathna, K.B. Nilantha Jayawardhana, Ms.K.C. Ranjani, T.A. Piyushan Gunasinghe, A.D.S. Wijethunga, K.G. Dilipa Shantha, G. Dayananda, G. Chandrasiri Kumara, G. Premasiri, G. Rupasinghe, G. Premathilake, Ms. G.M. Lakmali, W.H. Keerthisena, R.K.S. Mendis, K.S. Gunadasa
T-2	Construction of Colombo B 132/11 kV Grid Substation	Existing GSS, no public consultations were carried out		
T-3	Augmentation of Biyagama,	Existing GSS, no public consultations were carried out		

SNo	Name of the Component /Site	Name of the Village, Gramasevaka Division, District, Province	Distance from Project Location	Names of the Participants
	Kotugoda and Kolonnawa Old Grid Substations			
T-4	Padukka – Horana 23.7 km, 132 kV Transmission Development	**Name of the village/s:** i) Meegodadeniya ii) Thuttiripitiya iii) Malagala iv) Maputugama **Name of the GND:** i) Meegoda North 447 ii) 448 Watareka South iii) 467 Malagala iv) Maputugama 621 **Name of the DS Division:** i) Homagama ii) Hanwella iii) Ingiriya		Jeewaka Samantha Galagedara, Ms. Manjula Priyangani Dissanayake, Ms. Malkanthi Jayakodi, Ms. T.G. Danushika Lakmali, Ms. S.A. Ariyawathi, Ms. N. Ranjani, Ms. K.S. Damayanthi Priyadarshani, Ms. M. Somawathi, K.S. Gayan Sampath, Ms. B. Iresha Udayangani, K.S. Karunarathna, Senevirathna, Ms. K.A. Deepa, W.A. Kulasiri, K.S. Kalindu Tharanga, T.A. Usitha Lakshan
T-5	Construction of Biyagama 220/33 kV Grid Substation	Existing GSS, no public consultations were carried out		
T-6	Augmentation of Dehiwala Grid Substation	Existing GSS, no public consultations were carried out		
T-7	Second Circuit Stringing of Habarana – Valachchenai 100 km, 132 kV Transmission Line	**Name of the village/s:** i) Sewagama; ii) Eringa Oya; iii) Ulpath Ela; iv) Namalgama; v) Sewanapitiya; vi) Sarwodhagama; vii) Arfa Nagar **Name of the GND:** i) Sewagama; ii) No 30 Mahasengama; iii) 76 RBI; iv) Welikanda 278; v) 261 Sewanapitiya; vi) 207 Manampitiya; vii) Thyadawattam 210 C **Name of the DS Division:** i) Polonnaruwa; ii) & iii) Hingurakgoda; iv) & v) Welikanda; vi) Dimbulagala; vii) Korale Pattu		Ms. W.J. Grace, Ms. Udagedara Nandani Ashrawar, Ms. Shirani Munasinghe, Eranga De Silva, H.M.K.N. Herath, M.D. Madhusanka, Ms. I. Dilani Rathnayake, Sunil Pradeep, Ms. P. Chandi Sadamini, K.N. Lahiru Madhusanka, W.M.C. Weerasekara, N.K.S. Raveendra Samarasinghe, Ms. I. Karline Nona, H.M.N.K. Herath, M.M.S.B.Wijerathna, Ms. M. Inoka Dilhani, Ms. K.D. Anusha Lakmali, A.T. Ariyarathna
T-8	Augmentation of Madampe 132/33 kV Grid substation	Existing GSS, no public consultations were carried out		

T/L=Transmission line, GND=Grama Niladhari Divisions, DSD=Divisional Secretary Divisions

7.1 Consultation Findings

T-1. - New Polpitiya-Hambantota 220 kV Transmission Development

314. Pitakanda village people said that they have no previous knowledge about the project. They have no objection. Seems no point in objecting as the government will be proceeding anyway. They have the fear of increasing lightening in this area. Will the project cause **cutting down coconut trees**? The project should guarantee our safety. We would have fewer problems due to lines traversing over tea estates. Avoid the lines traversing over the houses **(Pitakanda).** Seems no point in objecting as the government will proceed with the project anyway. Our fear is **whether we will face a water scarcity** due to the destruction of trees. Water is taken from underground springs as there is no way of digging wells. There is a **risk of those springs getting dried up** with the cutting down of trees. The Broadland power plant initiated work in 2014 and since then has contributed to many social and environmental problems such as displacement of people, having underground tunnels that lead to the destruction of houses, and CEB claiming ownership to any land where a line traversed. This project is good but make sure that it does not damage us in any way. **Should not damage the water sources**. Lines should be insulated **(Polpitiya).** Would not object to this project as it is a development project. But if our crops and houses are destroyed then we would object. We fear that the vehicles that would be coming for the construction work would further damage our roads. If it happened, CEB should take responsibility for that. We **fear from increased lightening**. The small water power plants generate electricity from the water taken from the river. This led to the **drying up of water springs and created a water problem for the villagers**. We fear this problem would be further aggravated **if trees were cut for this project** too **(Adawikanda).** We would cooperate if our safety is guaranteed. Lines should not traverse over houses and towers should not be erected next to houses. No objection for lines going over tea estates. Last year a child died of lightening because the earth wire of a Mobitel tower was not installed. This area **receives 8-10 months of rain;** so would this increase the risk of lightening? Little children would try to climb towers. Tea plants would be destroyed and land would be converted to CEB property **(Polwatta).** Would not object as long as the lines don't go over houses. Some people may try to sabotage the project by spreading false rumours **(Uwella).** The land shown is used as a cemetery. If the lines go over that land then the impact would be less. Many trees will be lost. Some of these trees have been planted in the 1950's. **Cutting down trees will increase the temperature**. If lines go over the houses we will object due to security reasons and decrease of land value. People will cooperate mostly because it is a development project. Avoid erecting towers in small blocks of land **(Mikiliya).** No major objection to the project as there are no tall crops in the chosen land. Request proper lightening conductors to be placed to ensure safety **(Galpaya).** Would not mind the lines going over the cemetery and the government teak estate. But are **we are heavily worried about cutting down coconut trees**. Lines should not go over houses and small blocks of land. Cutting down coconut trees would heavily affect family economy. Temperature would increase and shelter would be lost. We will cooperate if our safety and future is ensured but we are still indecisive **(Simon place). We object to the project as it would destroy our coconut and teak plantations**. Proposed that the project to be conducted without any damage to the crops. We request the project to consider alternate routes for the line **(Hathporuwa).** There are claims that the area will be used for a highway and railway road. Will there be sufficient land for all these projects? Previously the villagers owned 50 perches. But from time to time parts of the land were taken by the government for widening roads, water lines etc. **sometimes no compensation was paid**. So now they only have around 30 perches. So the rest of the land should be protected for the children. Can't afford to look at the destruction of trees that took us more than 30 years to grow. Has second thoughts about the safety. Requests to look for alternate routes for the line **(Viharagala).** Villagers of Namadagaswewa do not object

to the project as they believe it would further develop their area. They fear the lightening as that may electrocute them if lines are put up. Requests to take suitable measures to prevent lightening. **One problem is the loss of coconut and teak trees**. Requests no damage to the crops while transportation of project machinery **(Hasthipura).**

315. Every family owns around 1 acre of land. People were given Jayaboomi deeds during the reign of President Chandrika Bandaranaike. Each family also owns around ¼, ½ acre of tea. Around 10 people own 1 to 2 acres of tea **(Pitakanda).** Some of the government granted lands don't have deeds. The land where the lines are supposed to traverse are completely government owned. People own blocks of 20, 40, 60 perches of land. Some own ½, 1 or 2 acres of land **(Polpitiya).** 80% of land is private and 20% is government granted land. Generally, a family owns 1 acre of land. 10% of the people own more than 5 acres **(Adawikanda).** 60%-70% are private land, the rest is government given. Some have Jayabhoomi deeds but some have none. There are around 7-8 people who own 5-6 acres. Many own ½, to 1 acre. Some own ¼ acre of land. Almost everybody has a tea plantation, at least ¼ acre. Tamils own no land. Sinhalese have both private and government granted land. Private land is approximately 70%. Most of the land is less than 1 acre. 10-15 families have land of 2-4 acres (**Uwalla).** 80% of the land are government and the rest is private. The government land has no deeds. We pay taxes and hold a permit. Some have 1 acre and some have 2 acres. Around 40% have received deeds. People have grown tea, pepper, coconut and teak in their lands **(Mikiliya).** Galpaya has land that was given by the government in 1983. At that time 2 acres were given per family along with Jayabhoomi deed. At present families own 1,2,3,5 acres of land. These are government Mahaveli lands. Some have deeds and some do not. These lands have been given during 1970's. Around 20 families have deeds and permits. A family has ¼, ½, 1 or 2 acres of land. 10-15 have 3 to 4 acres **(Simon Place).** No private land. All government given lands in the 1970's. A family has 2-5 acres of land **(Hathporuwa).** All land is government mahaveli land. There are no deeds but permits and some don't have that either. Deeds for paddy lands have been given. In 1982, each family was given 60 perches of highland and 1, 1 ½, 2, 2 ½ acres of paddy lands. Sometimes husband and wife submitted names separately and got more land. Water for farming is provided only during the farming time by the authorities **(Viharagala).** Has no private land. As they are given by the government land, they hold Swarna bhoomi deeds or permits. The initially given amount of land has now been divided among children. 80% own 40 perches - 2 ½ acres of land. Around 10% own less than 40 perches. They are illegal settlers **(Hasthipura).**

316. No issues in drinking water. Water becomes a little scarce during droughts. Villagers have built water ways with the help of Red Cross and Samurdhi program **(Pitakanda; Polpitiya; Adawikanda; Uwela).** People fear that water will become scarce if the trees were cut down **(Polpitiya).** Source of drinking water is from underground springs. Requests no damage to the water ways from this project. There are around 10-20 community water proposals **(Polwatta).** People along the main road get water from the National Water Supply Board. Others use well water. There are no community water projects in the area **(Mikiliya).** There is a water shortage problem. Well water is no longer suitable for drinking due to being highly saline. Villagers are bringing water for drinking from Pallebadda. There is no other water source in the village **(Galpaya).** Drinking water is taken from the National Water Supply Board as the well water is saline. Well water is used for making bricks **(Simon Place).** Water given by the Weniwalara community water project **(Hathporuwa).** Water is given from a private community water project. But during the drought water is scarce. People have to work for SLR 30,000 or more to get water. A government water line is placed but does not give water yet. There are a few wells but they have little water **(Viharagala).** Water is provided from the Weniwalara water project which requires a monthly payment. Recently there was a protest demanding solutions to the water

problem **(Hasthipura).**

T-2. - Construction of Colombo B 132/11 kV Grid Substation

T-3. - Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations

317. Construction/Augmentation inside existing CEB facility.

T-4. - Padukka – Horana 132 kV Transmission Development

318. People said they would object if it traverses over houses and highlands. We won't mind if it traversed over paddy lands **(Meegodadeniya).** Already there are two lines traversing over the paddy fields. For one line, **we had to cut down our trees**. If another line came then we will have to cut the **coconut trees and we will lose a part of our land** as well. Therefore, we object to this project. If the new line is placed next to the already existing lines, then it will traverse over the paddy lands. That will be fine. There was 66,000 kV line over the paddy fields once. When it was broken the copper wires were stolen (**Thuttiripitiya).** Will not object if the **line traversed over the paddy fields.** But will object if the line traversed over our houses and highlands. We can't lose the small block of land we have (**Malagala). We don't like our trees to be cut** and the lines to traverse over our houses. Even if the lines traversed over the paddy fields if we have to cut down all trees then we will object. Shift the route of the line. Lately this area has been affected by lightening. Mainly because the new factories have turned their lightening conductors in to the paddy fields. Therefore, we leave our paddy fields even in a small rain. This project can increase lightening. We fear for our safety **(Maputugama).**

319. Seventy percent of the families have their private drinking water wells. The families who do not have wells collect water from their neighbours. There is a community water supply project but its water dries up in the dry season **(Meegodadeniya).** Wells provide drinking water (**Thuttiripitiya).** Water is taken from some of the wells and a community water project **(Malagala).** Wells provide water **(Maputugama).**

T-5. - Construction of Biyagama 220/33 kV Grid Substation

T-6. - Augmentation of Dehiwala Grid Substation

320. Construction/Augmentation inside existing CEB facility.

T-7. - Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line

321. This line was built two to three years ago. No damage was inflicted on the houses but most of our **coconut trees were cut** and we suffered a huge loss. As this line is to be extended and not build a new line, we are okay. But we don't like **if more trees are going to be cut**. The line has brought no harm to the villagers so far. We have no objection and even in the earlier instance we were reasonably compensated. We would like if no further trees are destroyed **(Sewagama).** We have been living on this land for 12-14 years. At that time, there was only 1 line but now there are 3. We objected heavily but since we didn't have any permits for the land, our objections were ignored. There are huge towers near our houses and lines over our houses, therefore we fear our safety. Some of the villagers did not allow their trees to be cut. We wrote to the president and newspapers, and even protested by climbing the towers but that did not stop the line. We are unable to grow any trees in our land. And the authorities refuse to give permits to the land since there are 3 lines of the CEB across the lands. Our objections are

ignored by the authorities **(Erige Oya).** Due to this line, the value of our lands have decreased and no perennial crops can be planted. **Most of our trees were cut** and many more will be lost in the future. No compensation can cover up the loss of trees and paddy fields. The rate of lightening increased after this line. One person died from lightening. We fear our safety from the falling of the lines. Implement the lines with minimal issues to us. There is no point of us objecting since 70% of the work is done. If the lines can be drawn before or after our paddy farming, then our crops won't be damaged **(Ulpath Ela).** We have no objection as this is an existing line. Only a few of our trees were cut so we won't object. There have been no threats of lightening or crash of towers. Therefore, we don't fear for our safety (**Namalgama).** This land already has two existing lines. We had no problems up to now. The line that is proposed to be extended has been there for 3 years now. If the lines can be drawn before or after our paddy farming, then our crops won't be damaged. We will give the needed support **(Sewanapitiya).** We have not encountered any special problems due to the line. The line has not traversed over our land but 100 m away. No issues of lightening. It has been 4 years since that line has been erected. We would like if we get employment opportunities **(Sarvodhagama).** This project has many problems. The villagers have been living here long before the 1983 riots. After that they had to suffer due to the war. In 2000 the CEB announced that this line was going to be erected. And without any other pre-warning they had come and cut trees and built the towers. No compensation was paid to the villagers for their losses. The CEB has taken hold of many blocks of land. From the earlier project 15 families lost their place of living. They are unable to grow any tall trees. They object to this new line. But they know that their objections will be ignored **(Arfa Nagar).**

322. Well water is used by many houses. There is a line from the national water supply board too. For farming and bathing purposes water from the Mahaweli is used. No issues with water (**Sewagama).** The well water is unusable due to salinity. Drinking water is bought from lorries where 18 liters are sold at SLR 60 **(Eringa Oya).** Most of the well water is now not suitable for drinking due to salinity. Some people drink from wells that were certified as usable. Half of the village gets water from the line from the water supply board. But even that water is saline **(Ulpath Ela).** Water is taken from a water project or bought from Welikanda for money. The school uses well water **(Namalgama).** There are issues with drinking water. The well water is saline. Even the water of the water supply line is saline. Some use filters and some buy water from other villagers **(Sewanapitiya).** All families use water from the line of the Water supply board. But that line carries muddy water at times **(Sarvodhagama).** Have issues with water. The water supply board does not provide water to the village. During drought the wells run out water. During that time the urban council distributes water from a bowser but the households lack facilities to store that water **(Arfa Nagar).** No chronic illnesses. Satisfied with services provided by the Polonnaruwa hospital **(Sewagama).** Few cases of kidney disease. The village suffered from Malaria earlier but not now.

T-8. - Augmentation of Madampe 132/33 kV Grid substation

323. Construction/Augmentation inside existing CEB facility.

8.0 GRIEVANCE REDRESS MECHANISM

8.1 Awareness of Stakeholders

324. During Public consultation sessions of the IEE study, discussions with groups and individuals were conducted to make them aware of the proposed project. Thus, the project-affected community residing beside the proposed transmission line has gained a reasonable knowledge about the potential grievances, which will arise in the future.

325. A community awareness programme must be conducted one month prior to construction by the Project Implementation Unit (PIU) of CEB regarding the scope of the project, procedure of construction activities, utility of resources, identified impacts and mitigation measures. These awareness programmes will help the community to resolve problems, and clarify their distrusts related to the proposed project at initial stage.

326. The Community should be informed about the Grievance Redress Mechanism (GRM), which is already established by the Public Utilities Commission of Sri Lanka (PUCSL), procedure for making complaints, including the place and the responsible person to contact in practical way in this regard. Almost all the stakeholders related to the GRM will also be aware of the established grievance process, the requirement of grievance mechanism, goals, benefits, relevant laws regulations etc. PUCSL Act lays down procedures for Grievance Redressal for transmission lines as attached in **Annexure 7**.

8.2 The Grievance Redress Mechanism and PUCSL

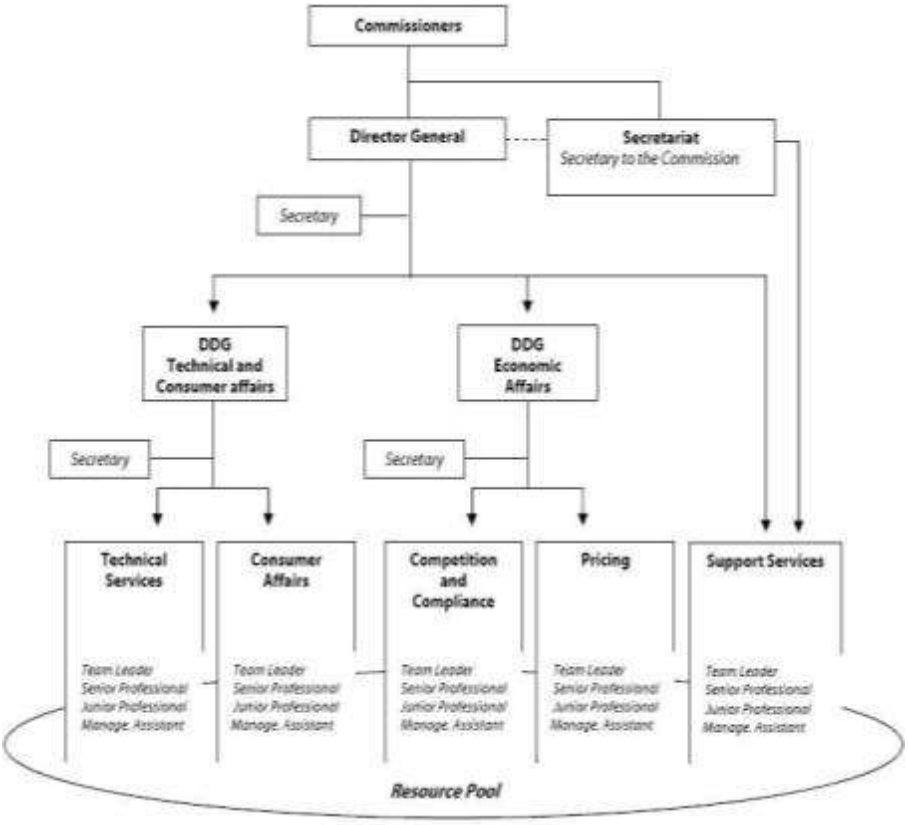
327. The Grievance Redress Mechanism (GRM) for the infrastructure development project provides an effective approach for complaints and resolution of issues made by the affected community in a reliable way. This mechanism will remain active throughout the life cycle of the project. The Public Utilities Commission of Sri Lanka (PUCSL) Act creates an environment for all inhabitants of Sri Lanka and the contributors to its development, to have access to essential infrastructure and utility services in the most economical manner within the boundaries of the sustainable development agenda of the country. PUCSL's mission is to regulate all the utilities within its purview to ensure safe, reliable and reasonably priced infrastructure services for existing as well as future consumers in the most equitable and sustainable manner. **Figure 25** depicts the PUCSL hierarchy.

328. All the members in PUCSL need to be informed by the PIU regarding procedures of GRM. The information should include procedures of taking/ recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders etc. PUCSL has a standard mechanism of (i) informing the affected people GRM and its functions, (ii) how peoples representatives in the GRC will be selected, (iii) procedure and the mechanisms adopted for making the complaints, (iv) supporting the complainants in communicating their grievance and attending the GRM meetings and (v) implementing compliance to a GRMs' decision, its monitoring and communication to the people. Periodic meetings of PUCSL are to be conducted by the PIU so that all the members of the PUCSL are familiar with the problems and responses received by individuals in the PUCSL.

329. CEB does not have any specific Environment or Social Safeguards Policy regarding generation/transmission/distribution subprojects currently. ADB procedures require CEB to establish a Grievance Redress Mechanism (GRM) having suitable grievance redress procedure to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances

about the subproject's environmental performance. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. A common GRM will be in place for social, environmental or any other grievances related to the project. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project. The GRM procedure for the project is outlined below, which follows a time-bound schedule, with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required.

Figure 25: Responsibility Hierarchy of PUCSL



330. The grievance mechanism will be scaled to the risks and adverse impacts on environment due the subproject type, size, type of area (sensitive area) and impacts. It should address affected people's concerns and complaints promptly, using a transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. This GRM would consist of a Grievance Redress Committee (GRC) headed by the Project Head. The committee would consist of the following constitution as listed in **Table 38**.

Table 38: Constitution of Grievance Redress Committee

1	Project Head, CEB
2	Division Secretary or their nominee
3	Representative of Gram Niladhari/Council
4	Women representative of village/council
5	Representative of EPC* contractor

6	Environment Officer at PMU or nominee

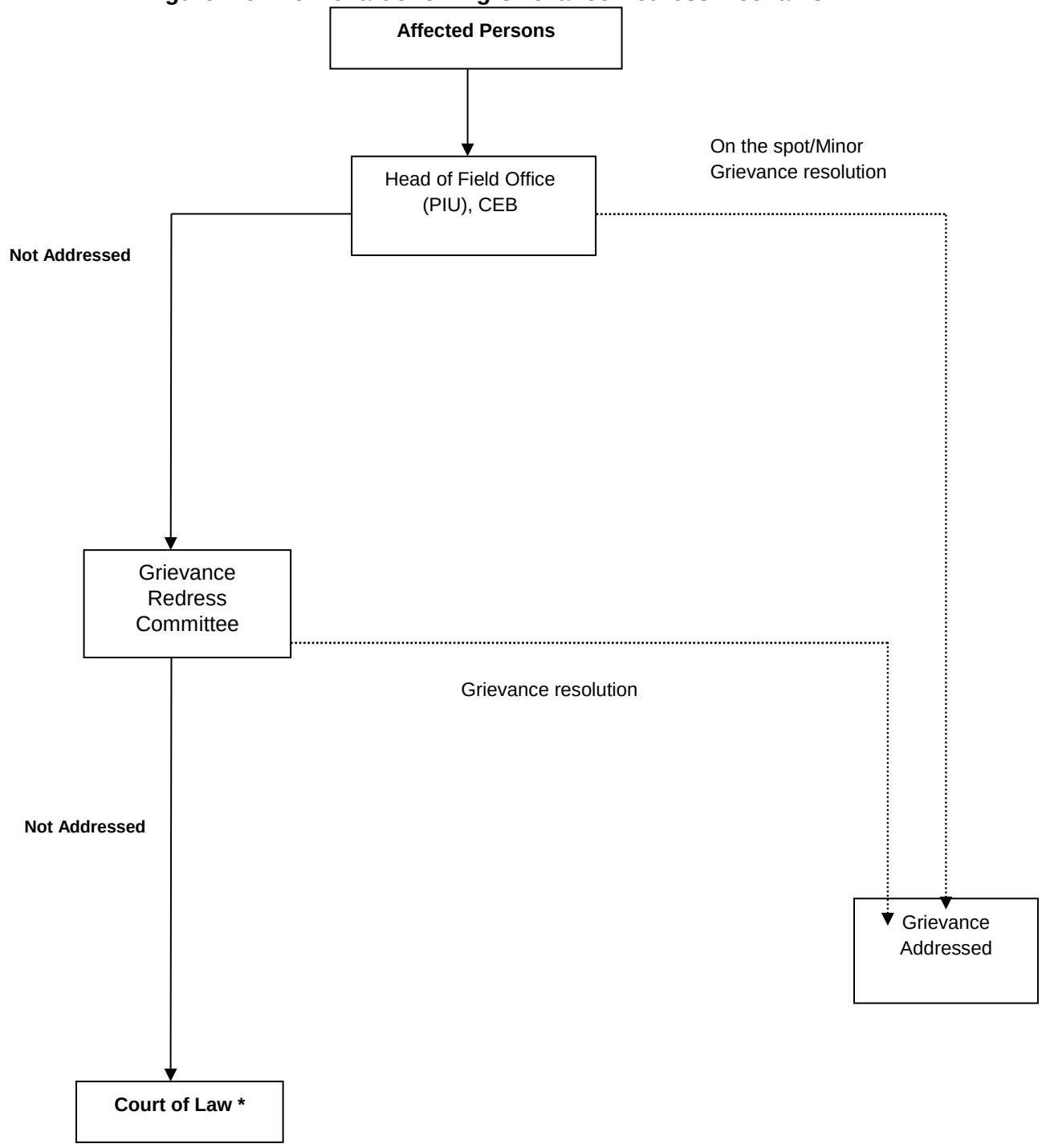
* (EPC) - Engineering, Procurement and Construction Contractor

331. This Grievance Redress Mechanism (GRM) will provide an effective approach for resolution of complaints and issues of the affected person/community. Project Management Unit (PMU) shall formulate procedures for implementing the GRM, while the PIUs shall undertake GRM's initiatives that include procedures of taking/recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders etc. paying particular attention to the impacts on vulnerable groups.

332. Grievances of affected persons (APs) will first be brought to the attention of the Project head of the PIU. Grievances not redressed by the PIU will be brought to the Grievance Redress Committee (GRC) set up to monitor subproject implementation for each subproject affected area. The GRC will determine the merit of each grievance, and resolve grievances within an outer time limit of three months of receiving the complaint. The proposed mechanism does not impede access to the country's judicial or administrative remedies. The AP has the right to refer the grievances to an appropriate courts of law/PUCSL if not satisfied with the redress at any stage of the process.

333. The PIU will keep records of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome. The flow chart showing Grievance Redress Mechanism is presented in **Figure 26**.

Figure: 26: Flow chart showing Grievance Redress Mechanism



(*) Affected Persons can approach the court of law/PUCSL at time during the Grievance redress process.

9.0 ENVIRONMENTAL MANAGEMENT PLAN

9.1 Environmental Management Plan

334. The Environmental Management Plan (EMP) has been prepared for the sub-project that discusses the anticipated impacts, monitoring requirements, and development of mitigation measures with respect to the following stages: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Detailed, site-specific mitigation measures and monitoring plans were developed and will be implemented during the project implementation phase.

335. The EMP for the project is attached as **Annexure 5**, which identifies feasible and cost - effective measures to be taken to reduce potential significant, adverse, impacts to acceptable levels. Here, proper mitigation measures are proposed for each potential impact, including details on responsible parties for implementation of mitigation measures and supervision. A summary environmental impact matrix and the mitigation measures are given in **Table 39** below.

Table 39: Environmental Impact Matrix

Sl. Nº	Environmental attribute	Potential impacts	Nature of impact	Magnitude of impacts			Mitigation measures	Implementation & Monitoring
				Low	Medium	High		
A.	**Physical Resources**							
1.	Topography	Change in the surface features and present aesthetics due to the construction of the project.	Direct/Local/ irreversible		X		The surface soil will be restored to normal slope after tower erection. If there is any excess soil, it shall be disposed off at suitable location. Any loss of vegetation will be attended by CEB as per existing GoSL norms. Within the substation, the excess soil will be disposed off in consultation with CEB as per EMP. The compensatory afforestation of equivalent area of forest land in RoW will be undertaken by the Forest Department to compensate for the loss on CEB expenses to minimise the impact of loss of vegetation as per existing norms under the Forest (Conservation) Act 2002.	During construction phase
2.	Climate	No impacts on the climatic conditions	Direct/Local/ irreversible	X			No measure impact on the climatic conditions, hence no mitigation is required	
		SF_6 gas from Electrical Substations	Direct/Local/ irreversible	X			(i) regular monitoring of SF6 through pressure gauges; (ii) use of handheld leak detectors to monitor leaks; (iii) prepare annual inventory checklist of SF6 consumption, purchase, and losses to track emissions, and (iv) provide training to staff on proper handling of SF6.	During operation
B.	**Environmental Resources**							
1.	Air Quality	Project will have marginal impact on air quality during the construction period	Direct/Local/ reversible	X			Water sprinking at construction site, limited bare soils, proper maintenance of vehicles etc.	During construction

Sl. Nº	Environmental attribute	Potential impacts	Nature of impact	Magnitude of impacts			Mitigation measures	Implementation & Monitoring
				Low	Medium	High		
		due to increase in the dust emission.						
2.	Noise	Noise due to general construction activities.	Direct/Local/ reversible	X			Restriction of noise generating activities at night. Installation of screens to reduce construction and operational noise to be installed for neighbouring community. Use of personal protective equipment like ear plugs, mufflers etc. for workers.	During construction
		Noise arising from corona noise from conductors	Direct/Local/ reversible	X			Monitoring of possible corona noise to identify and correct problems.	During operational phase
3.	Surface and Ground Water quality	Runoff from the construction site	Direct/Local/ reversible	X			Careful siting of towers and access roads.	Before and during construction
		Domestic wastewater from construction sites	Direct/Local/ reversible	X			For transmission line, domestic wastewater treatment may be done by digging small ditches for wastewater and then covering it with top soil once the construction team moves to next location. For substation site, the contractor shall provide soak pits for construction workers at the site.	During construction and operation
4.	Soils and Geology	Soil erosion due to tower erecting and clearing of vegetation in the RoW and access roads.	Direct/Local/ reversible		X		Avoiding sites, which are prone to the soil erosion. Careful siting of towers and gantry. Include standard provisions for chemicals, oils and fuels during construction to be kept in a bunded area of 110% volume away from the watercourses and for plant refueling away from watercourses etc. Levelling of construction sites. Adoption of proper slope protection measures. Use of few access roads. Rehabilitation and stabilisation of disturbed land.	During and after the construction activities
		Damage due to seismic	Direct/region	X			Site selection and proper tower	Before the

Sl. Nº	Environmental attribute	Potential impacts	Nature of impact	Magnitude of impacts			Mitigation measures	Implementation & Monitoring
				Low	Medium	High		
		activity	al/reversible				foundation design considering the geological conditions and seismicity of the area.	construction activity.
C.	**Ecological Resources**							
1.	Terrestrial Ecology	Loss of vegetation	Direct/Local/ irreversible			X	Location of towers on non-cultivable land area. Selection of few access roads. Compensation for crop and trees (including plantation and home gardens) to villagers. The tree planting for forest land diverted to non-forest and trees felled will be done by the forest department and paid by CEB.	Before the construction phase
2.	Terrestrial Fauna	Disturbance to the local fauna during construction	Direct/Local/ reversible	X			Wildlife routes and their habitats has been avoided as far as possible during the route selection. Minimise encroachments, and indirect impacts.	Before and during construction phase
		Disturbance to the local fauna during operation	Direct/Local/ reversible	X			Monitoring of line especially for bird strikes during the operation and use of deflectors, cable bollards, other measures, if required.	During operation phase
3.	Aquatic Ecology	Runoff water from GSS construction site and labor camps.	Direct/Local/ reversible		X		Appropriate setback for all construction and camp sites and proper disposal of wastewater waste to avoid polluting the river and streams. Care to avoid harming the aquatic ecology during construction of tower bases.	During construction and operational phase
D.	**Human Environment**							
1	Health and Safety	Fires, explosion and other accidents at the route alignment of transmission line.	Direct/Local	X			Use of personal protective equipment during construction. By lopping and chopping of trees fire hazards will be avoided during maintenance period. Regular inspection of lines for faults prone to accidents.	During construction and operation phase

Sl. Nº	Environmental attribute	Potential impacts	Nature of impact	Magnitude of impacts			Mitigation measures	Implementation & Monitoring
				Low	Medium	High		
		Exposure to electromagnetic fields	Direct/Local/ continuous	X			Alignment route away from the settlement. Houses will be allowed in the RoW of the alignment only if the relevant safety clearance is met with.	Before and after the construction phase.
2.	Agriculture	Permanent and temporary loss of agriculture land due to tower erection and due to access routes.	Direct/Local/ reversible	X			Avoid prime agriculture/plantation land and home gardens. Assessment of land required and compensation. Construction activity after crop harvesting and selection of few access routes.	Before and during construction phase.
3.	Socio-economics	Beneficial impacts from rural and urban electrification. Job opportunities during construction phase	Direct/regional		X		Unskilled labor and indirect benefits. Overall economic growth of the region.	During operational phase
4.	Resettlement	Resettlement of the house falling along the RoW.	Direct/Local/ irreversible	X			Route alignment is selected in such a way that there is no resettlement issue.	Before the construction phase.
5.	Cultural sites	No archaeological, historical or cultural important sites are affected by the construction of the lines.	Direct/Local/ irreversible	X			Archaeological, historical or cultural important sites avoided, hence no mitigation required	During Design.
6.	Traffic and Transportation	Traffic congestion due to movement of construction vehicles	Direct/Local/ reversible	X			Avoid high density traffic areas, proper traffic signs at the construction site, ensuring availability and maintenance of proper access roads	During construction phase
7.	Solid Waste Generation	Probability of surface and groundwater pollution	indirect/Local/reversible	X			Minimisation, reuse and recycle whenever possible. Separated wooden and scrap will be collected and disposed of in compliance with applicable regulations and rules.	During operation phase

9.2 Environmental Management Plan Budget Costs

336. The compliance with the EMP has been prepared based upon optimum and reasonable costs that are derived upon minimisation of mitigation measures on a “least-cost” basis. Without such expenditures, the project might generate significant environmental impacts, causing the biophysical environment in the area to deteriorate and indirectly depressing the economies of local communities. The main benefits of the mitigation plan are (i) ensuring that environmental standards are met during design, construction, and operation of the project; (ii) providing offsets to negate project impacts especially ecological impacts.

337. As shown in **Table 40,** USD 2.12 million has been included as the Environmental Mitigation (which includes EMP costs). The compliance costs for minimisation of mitigation measures for the EMP has been arrived based on optimum and “least-cost” basis. Typically, the EMP costs will include:

i. cost for implementation of environmental mitigation measures,
ii. cost towards monitoring costs, independent audit costs for the project, and
iii. cost of compensatory afforestation (if any).

Table 40: Summary of Estimated Costs including for Environmental Management Plan (EMP) Implementation (in million USD)

Breakup Tranche 2	T1	T2	T3	T4	T5	T6	T7	T8	Total USD Million
Environment Mitigation *	0.95+0.073	0.11	0.09	0.06	0.11	0.03	0.02	0.02	2.12
Resettlement Costs	0.63	0	0	0.14	0	0	0.63	0	1.4

Source: DPR reports from CEB

* Environment mitigation put as 1% of base cost Consists of all EMP and Environmental Monitoring. Afforestation costs are extra on top of it.

LEGEND:

T-1	New Polpitiya-Hambantota 220 kV Transmission Development
T-2	Construction of Colombo B 132/11 kV Grid Substation (including Colombo C)
T-3	Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations
T-4	Padukka – Horana 132 kV Transmission Development
T-5	Construction of Biyagama 220/33 kV Grid Substation
T-6	Augmentation of Dehiwala Grid Substation
T-7	Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line
T-8	Augmentation of Madampe 132/33 kV Grid substation

9.3 Monitoring of Environmental Management Plan (EMP)

338. The mitigation measures suggested required monitoring of environmental parameters - both during construction and operational phases of the project. The monitoring of the environmental aspects shall be ensured by the Transmission Design and Environment Branch (TDE) of CEB. During the construction phase, the contractor should ensure that activities like handling of earth works, disposal of debris, storage of materials, labour camps, putting proper traffic signals is done properly to have minimum impact. This in turn should be monitored by the Project Manager of the individual transmission line/substation subproject. The PIU will supervise the contractor. Other environmental good practices include sanitary waste management, noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment.

339. The TDE will ensure that site engineers and contractors adhere to and comply with all measures and procedures identified in the EMP. Activities to be monitored include all planning, coordination and management activities related to the implementation of safeguard issues; the identification of corrective and preventive actions; records of health and safety matters and training activities; consultations with project affected people (as and when needed, particularly during the implementation); feedback, trouble shooting and project related grievances; preparation of progress and monitoring reports as required by the ADB; and verifying the projects overall compliance with safeguard measures and its progress towards achieving the intended loan outcomes.

Environmental Parameters to be Monitored

340. To ensure that project would not generate negative impacts to the overall environment quality, monitoring of environmental parameter has to be performed by CEB/Contractor as per contract provisions. The monitoring activities of the project include site supervision, verification of permits, monitoring of water quality, soil, noise and air. Monitoring of the quality of water, soil, air and noise during the construction stage is the responsibility of the contractor by the approved government agency. The measurement of environmental parameters and its periodicity for the Project is summarised in **Annexure 6**.

Reporting

341. Mitigation measures related to construction as specified in the EMP will be incorporated into civil works contracts, and their implementation will be primarily the responsibility of the contractors with the supervision of CEB. In addition, contractors will be required to submit monthly progress reports on the implementation of EMP measures to PIU/PMU. The PMU will report to the ADB on progress achieved against the EMP activities and milestones on a semi-annual basis. Progress reports will include a description of implementable activities and their status; identify the responsible parties involved in their implementation; and provide project management schedules and timeframes for doing so, along with their associated costs. During the operation phase, CEB will submit environmental monitoring report on an annual basis.

342. The TDE after interaction with Project managers of PIUs will prepare and submit performance monitoring reports to the ADB twice in a year. This report will include the results of environmental monitoring to demonstrate that sound environmental management practices are applied, and the set environments targets are achieved. The environmental monitoring report will be submitted by the PIU to the PMU, which will include the result of environmental monitoring into its environmental report. An illustrative environmental reporting format is attached in **Annexure 7.**

343. In case the implementation of EMP measures is not satisfactory, CEB may engage qualified experts, if required, to verify monitoring reports and assess the significant impacts and risks. ADB will continue to monitor project compliance with ADB safeguard plans and requirements on an on-going basis throughout the duration of the contract.

9.4 Implementation arrangements

344. According to the National Environmental Act (NEA), there exists a mandatory requirement to obtain the environmental clearance from the Central Environmental Authority or a Project Approving Agency (PAA) which is authorised under the NEA for any kind of power

plants of prescribed capacity and transmission lines over 50 kV in capacity, and above 10 km in length. In most cases, Central Environmental Authority (CEA) designates the Ministry of Power and Renewable Energy as the PAA for the environmental approval process for transmission line. Therefore, the Ministry of Power and Renewable Energy has established an environment cell in the Planning Division to implement the requirements of NEA. CEB will be the Executing agency (EA) and the Implementing Agency (IA) for sub-projects in Tranche 2. The Project Management Unit[5] headed by a Deputy General Manager, reports to the General Manager of CEB with appropriate staffing to represent the EA since the time of previous loans.

345. PMU has designated Environment Officer of Environment Unit at Transmission Design and Environment (TDE) Branch of CEB (TDE who has oversight responsibilities for monitoring for all sub-projects in areas such as Environment, R&R and Social safeguards. To assist TDE in these specialist functions, CEB will hire appropriate Environment and Social Consultants at PIU level, as deemed necessary or as stipulated by CEA's environmental clearance to assist TDE in day-to-day coordination and reporting for various subproject activities.

346. The duties of the TDE will include at a minimum: (i) oversight of field offices and construction contractors for monitoring and implementing mitigation measures; (ii) liaisoning with the field offices and contractors and seeking their help to solve the environment-related issues of subproject implementation; and (iii) preparation of environmental monitoring reports every 6 months (as required by ADB), which will be uploaded on ADB website. TDE must coordinate with PIUs for monitoring as well as designing appropriate mitigation measures to address environmental and social issues[6].

347. The duties of the Transmission Design and Environment Branch at the corporate level:

- Monitoring and implementation of mitigation measures during design, construction and operation phases of the project.
- Coordinate the preparation of suitable environmental monitoring reports at various project sites.
- Advising and coordinating field environmental management cells activity towards effective environment management.
- Liaise with the Ministry of Power and Renewable Energy (MPRE) and Central Environmental Authority (CEA), and other relevant agencies and seek their help to solve the environment related issues of the project implementation.
- Advice project planning cell on environmental and social issues to avoid negative environmental impacts.
- Provide training and awareness on environmental and social issues related to power transmission projects to the project staff.

348. The duties of the the Transmission Design and Environment Branch at the Field level:

- Implement the environment policy guidelines and environmental good practices at the sites.
- Advising and coordinating the field offices activity towards effective environment management.

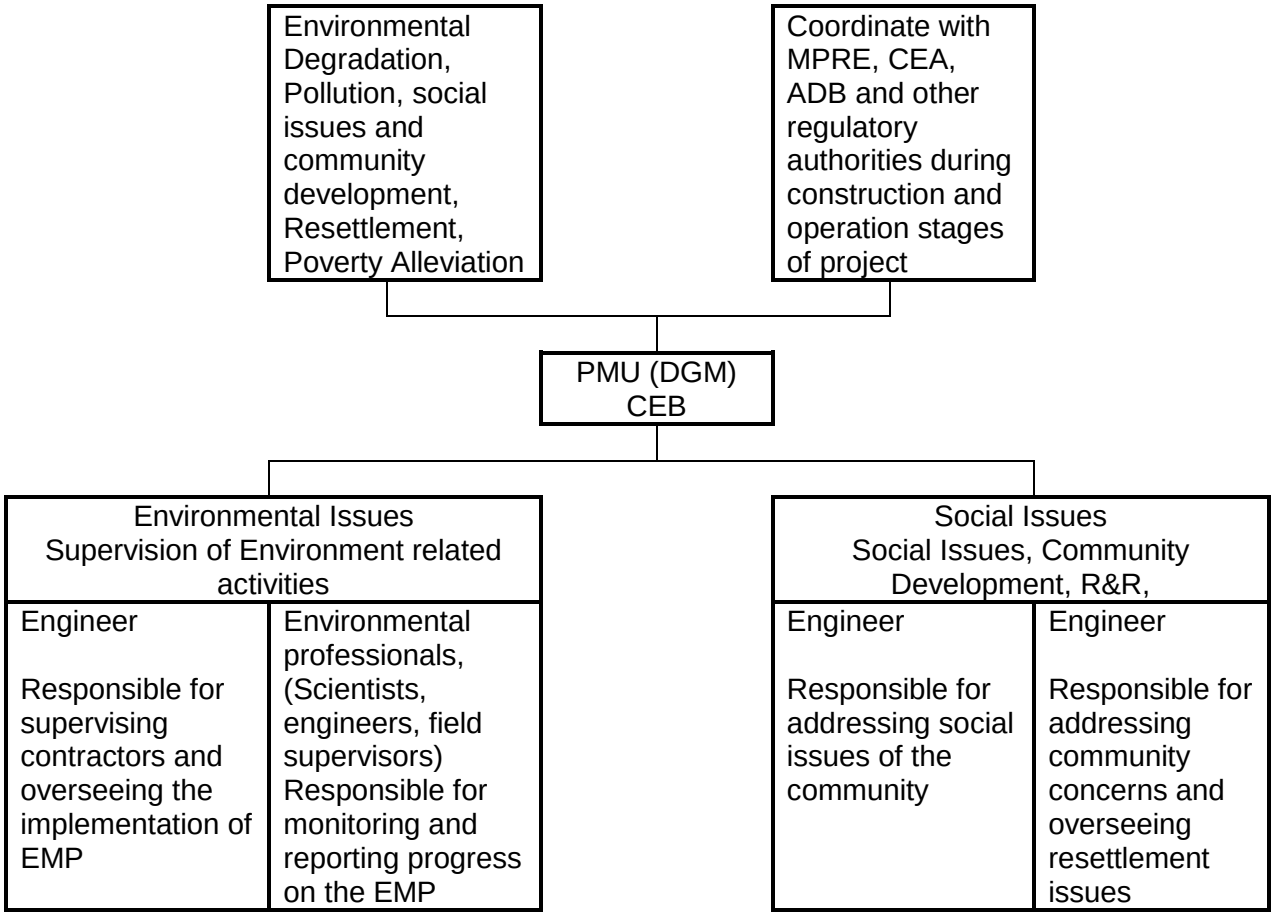
[5] PMU provides Institutional support for financial management and institutional capacity development to all PIUs.

[6] ADB advises that all EAs develop in-house capability for environmental, health, and safety (EHS) program consistent with international best practices. The EHS program should include accounting for environmental benefits resulting from investment projects within three months of loan approval. The monitoring agency shall report on semi-annual basis directly to ADB and determine whether sound environmental management practices have been achieved, and suggest suitable recommendations and remedial measures for midterm correction and improvement.

- Liaise with the forest department and seek help of forest officers in resolving environment monitoring related issues.
- Carry out environmental and social survey in conjunction with project planning cell to avoid negative environmental impact.
- Make the contractor staff aware on environmental and social issues related to power transmission projects so that EMP could be managed effectively.

349. The mitigation measures suggested requires monitoring of environmental attributes both during construction and operational phase of the project. The **Figure 27** below depicts the institutional organisation structure showing the various entities within CEB and their role vis-à-vis- other government agencies.

Figure 27 Institutional Structures and Responsibility for Environmental Management Plan at Ceylon Electricity Board (CEB)



PMU = Project Management Unit, EMP = environmental management plan, MPRE = Ministry of Power and Renewable Energy, PIU = Project Implementation Unit

9.5 Critical Environmental Review Criteria

(i) Loss of irreplaceable resources

350. The transmission/electrification projects do not involve any large-scale excavation and land lost is insignificant. The EMP includes compensation for the loss by minimising the impact of loss of vegetation as per existing norms under the Forest (Conservation) Act, 2002. There will be no net biodiversity loss in this project due to the afforestation being done by Department of Forests.

(ii) Accelerated use of resources for short-term gains

351. The project will not use any natural resources occurring in the area during construction as well as its operation cum maintenance phases. The construction material such as tower material, cement etc. shall come from factories mostly from abroad, while the excavated soil shall be used for backfilling and revetment to restore the surface. Thus, the project shall not cause any accelerated use of resources for short-term gains.

(iii) Endangering of species

352. Very few endemic species of flora and fauna exist in the project area and adjoining forest areas, but the project activities will not threaten or cause their extinction. Elephants are present outside Protected Areas in Sri Lanka, however, these areas are not categorized as critical habitats (because elephants are not critically endangered species)[7].

(iv) Promoting undesirable rural-to urban migration

353. The project will not cause any submergence or loss of land holdings that normally trigger migration. It also does not involve acquisition of any private land holdings. Hence, there is no possibility of any migration.

(v) Increase in affluent/poor income gap

354. The project will increase availability and reliability of power. Power is a key input to the economic development of any area. Experience indicates that economic development leads to generation of more jobs, which in turn should raise the living standards of poor. Thus, the project will contribute to reduction of affluent/poor income gap by providing opportunities for employment and rural based economic activities.

9.6 Associated Facilities

355. There are no associated facilities identified for the transmission line subprojects at present. However, GSS are proposed to be connected to new generation facilities sometime in future in line with CEB's long term generation plan 2013-2032.

[7] According to the National Redlist (2012) elephants are endangered species.

10.0 CONCLUSIONS AND RECOMMENDATIONS

356. Environmental impacts likely to result from the proposed transmission system development are mostly temporary and manageable, and can be managed cost effectively. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for subprojects have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts that could not be specified or identified at this stage, are now taken into account and mitigated where necessary. Those impacts can be reduced through the use of mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes.

357. The Polipitya GSS, Habrana GSS and Padukka GSS were funded under previous ADB projects. The construction of substation involves utilisation of existing CEB lands for 220/33 kV Biyagama, 132/33 kV old Biyagama, Kotugoda and Kolonnawa Old Grid Substations GSS's, 32/11 kV Colombo B GSS, 132/33 kV Madampe GSS. For the proposed 220/33 kV Hambantota GSS will be built on 10 acres' government land (owned by Mahaweli Authority in the Greater Hambantota Aevelopment Area). Very small number of trees have to be removed from the land at Hambantota GSS.

358. The proposed project will have number of positive impacts and negative impacts to the existing environment as follows:

- Significant improvement of the quality and reliability of the electricity supply to the project affected area according to current demand is the main positive impact.
- Removal of trees for the transmission line corridor is the main negative impact to the proposed project area.
- Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, disturbance to the farming activities, nuisance from dust, noise, vehicle fumes, black smoke, vibration etc. due to construction activities are the short term negative impacts due to proposed project.

359. No reliable baseline information of water air and noise /vibration in these areas with respect to transmission line and substation is available. Therefore, collection of baseline parameters of water, air, soil, and noise / vibration is being recommended to conduct sampling at locations as mentioned in EMoP. Establishment of baseline parameters is essential to monitor changes of the quality of water, air, soil and noise during the construction and operation periods.

360. Proper GRM will be implemented through PUCSL to overcome public inconvenience during the proposed project activities

361. Benefits far outweigh negative impacts - the proposed project will improve operational efficiency and quality of power, reliability of the system and at the same time will reduce losses. Supply of power to the region will boost economic development of the area by strengthening the power transmission infrastructure. Overall, the major social and environmental impacts associated with transmission projects are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices. The impact matrix depicts that the project will not have significant negative environmental impacts and the project would help in improving the socio-economic conditions of this developing state.

362. Based on NEA, the proposed project will be categorised as "prescribed" and accordingly,

approval and environmental clearance for the project will be required by CEA. In accordance with the ADB's SPS 2009, the proposed construction of new grid substations of Hambantota, the construction of two transmission lines (144 km long Polipitiya – Hambantota 220 kV and 23.7 km long 132 KV Habrana – Padukka line); and augmentation of Old GSS's fall under "Category B". Thus, an IEE report has been prepared for the project for meeting ADB's SPS 2009. The environmental approval process under the NEA is also under progress. The IEE performed is adequate for purposes of project implementation. Based on the environmental assessment and surveys conducted for the project, the potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the mitigation measures identified in the EMP. Adequate provisions are being made in the project to cover the environmental mitigation and monitoring requirements, and their associated costs.

363. Although the overall Tranche 2 environment category is "A" due to other projects, the environmental classification for Transmission Infrastructure Enhancement falls in Category B as per the ADB's SPS 2009, no detailed EIA study is required.

Annexure 1 System Design Standards Followed by CEB for Setbacks etc.

Voltage definition

Reference to voltage levels are in accordance with the following values.

Extra low voltage	-	normally not exceeding 30 volts.
Low voltage	-	exceeding 30V, but not exceeding 650 to earth or 1kV between phases
High voltage	-	exceeding 1kV, but not exceeding 33kV
Extra high voltage	-	exceeding 33kV

System design parameters

Electrical design parameters

The following electrical design parameters have been adopted in the new construction standards.

System frequency 50 Hz

High voltage	11kV	33kV	132kV	220kV
Nominal system voltage /kV	11	33	132	220
Maximum system voltage /kV	12	36	145	245
Lightening impulse withstand voltage /kV	75	170	800	1050
Wet one minute power frequency withstand voltage /kV	28	70	300	395
Minimum overall creepage distance /mm	254	699	3100	4800

Low voltage

Nominal system voltage /V	400/230
Maximum system voltage /V	440/254
One minute test voltage /V	2000
Impulse withstand voltage /V	6000

Physical design parameters

The following physical design parameters have been adopted in the projected area.

Climate - equatorial, intense sun shine, heavy rain and dust laden atmosphere.

Annual average air temperature	-	27°C
Average annual rainfall	-	2400 mm
Relative humidity	-	72 - 84 %
Average annual Isokeraunic level	-	80 days

Conductor and structure parameters

Conductor sag and tensions will be determined in accordance with the following parameters.

Maximum conductor tension determined at minimum temperature with maximum wind loading.

Maximum conductor sag determined at maximum wind with no wind.

Constant conductor tension occurs at defined normal everyday temperature. This is the assumed average temperature at which conductor sting will occur.

LOADING AND TEMPERATURES

		Pole lines	Tower lines
ASSUMED WIND LOADING			
Wind Pressure on Conductors and Earthwires	N/m2	575	970
Wind Pressure on Insulators	N/m2	865	1170
Wind Pressure on Lattice Steel Supports	N/m2	1370	1640

ASSUMED TEMPERATURES OF CONDUCTORS & EARTHWIRES		Pole lines	Tower lines
Minimum Temperature	oC	15	7
Everyday Temperature	oC	32	32
Minimum Temperature	oC	65	75

MINIMUM FACTORS OF SAFETY

Conductors and Earthwires at Maximum Working Tension based on Ultimate Strength	2.5
Conductors and Earthwires at Everyday Temperature still Air Tension, based on Ultimate Strength	4.5
Anchor Clamps and Mid-span Joints, based on Ultimate Strength of Conductor and Earthwire	0.95
Insulator Strings and Fittings at Maximum Working Tension based on Failing Load	3.0
Straight Line Supports and Foundations under Normal Working Loads	2.0
Angle, Section and Terminal Supports and Foundations under Normal Working Loads	2.5
Towers under Broken Wire Loads	1.25
Foundations under Broken Wire Loads	1.5

Clearance from ground and structures

Overhead line conductors shall have the following minimum clearances :

a) above ground

	33kV	11kV	Low voltage
across a public road	6.4m	6.1m	5.5m
any other positions	6.1m	5.2m	5.0m
in any other place inaccessible to vehicles	4.9m	4.6m	4.6m

flying guy wires- across any road or street 5.5m

b) from buildings, other structures, and trees

	33kV	11kV	Low voltage
vertical clearance	3.0m	2.7m	2.4m
horizontal clearance	2.0m	1.5m	1.5m

c) Clearances from Railway Lines

	33kV	11kV	Low voltage
minimum clearances from rail.	7.0m	6.7m	6.7m

No pole or support shall be erected nearer than 3.1m on sidings, and 4.0m in all other cases, from the centre of the nearest railway track to the near face of the pole or support. The pole at each side of the crossing span shall be imbedded in concrete with a minimum depth of 300mm below ground level and a minimum radial thickness of 600mm. The span crossing the railway line shall not exceed 50m, and no joints shall be made in the crossing span, nor in the full span on each side. Double crossarms fitted with insulators shall be erected on the poles at each side of the crossing span.

d) Clearances form Other Conductors

Overhead line conductors shall have the following clearances from other conductors:

a) between other overhead conductors

	LV	11kV	33kV
low voltage			
- vertical clearance	0.6m	1.2m	1.5m
- horizontal clearance	0.3m	1.2m	1.5m
11kV			
- vertical clearance		0.6m	1.2m
- horizontal clearance		0.7m	0.9m
33kV			
- vertical clearance			1.0m
- horizontal clearance			0.9m

NB : lines of a lower voltage shall not be carried above lines of a higher voltage.

b) from telephone lines

33kV	11kV	bare low voltage	low voltage insulated
1.8m	1.8m	1.2m	0.6m

c) phase to earth clearances

I) 33kV	0.32m
ii) 11kV	0.12m

Safety Clearances - In the interests of personnel safety, safe working clearances shall be as follows:

33kV	11kV	bare low voltage (except neutral)
610mm	300mm	150mm

Operators of any mechanical equipment such as diggers, cranes etc., or drivers of vehicles with high loads etc. Shall be required to maintain a minimum safety distance of 3.5m between their plant and any conductor of any live overhead line. In special circumstances where approval is given in writing this could be reduced to the following minimum distances:

33kV	11kV	bare low voltage
2.0m	1.5m	1.0m

Construction of building, structures, scaffolding or similar shall be limited to a safety distance no closer than 4m from any overhead line.

Tower line		220 kV	132 kV
Minimum Clearance from Conductor: To Ground	m	7.01	6.71
Metal Clad or Roofed Buildings, or other Buildings or Structures upon which a man may stand	m	4.65	4.10
To earthed cradle Guard Wires	m	3.96	3.96
To Electric power Line Wires (Line to Earth)	m	4.57	3.66
To be added to the above Clearance to Allow for Conductor Creep (at Mid Span)	m	0.30	0.30
Minimum horizontal spacing between outermost conductor of adjacent power line in still air	m	15.3	15.3
Spacing between P + T Line and cradle guard	m	1.83	1.83
Minimum clearance from live metal to earth metal	m	2.2	1.65

6033 3 one

CEYLON ELECTRICITY BOARD
14 OCT 1993
P.R.) BRANCH

My No : AGM/PLX6/10/1

G. M. PROJECTS
13-10-1993
CEYLON ELE

General Manager, CEB

Clearing Right of Way
(Wayleaves Clearance)

Addl. G.M. (D & C S) has requested our recommendation regarding the width of clearance for Right of Way purposes for 220 kV lines.

The past practice in the CEB has been to maintain the following clearances on each side of the transmission line :

220 kV	-	100 ft.
132 kV	-	60 ft.

I recommend the following widths of right of way for long span transmission lines.

Transmission Voltage kV	Recommended width of Right - of - way M
66	18
132	27
220	35

All Project Managers
f.i. nl.
15/10

In addtion to this, when constructing a 220 kV transmission line, the person who executes the work should use his discretion and clear any tree outside the track which could fall on to the transmission line. The values given above have been determined after taking into consideration the height of the transmission tower, maximum sag of the conductor and the minimum electrical clearance to earthed objects. They are same as those given in Indian Standard : 5613 (Part 11/Sec 2) - 1976 (code of Practice for Design, Installation and Maintenance of Overhead Power Lines)

Addl. General Manager (Planning)

1993 OCT 07
General Manager
CEYLON ELECTRICITY BOARD

PL. note

Office of the AGM (Pl.)
C.E.B., Colombo 2.
06th Oct., 1993.

Copy to :- Addl.G.M. (D & C S) - Ref. your letter No. AGM(D&CS) /Tech. dated 08th Sept.1993.

LINE CLEARANCES

Description of Clearance	Minimum Clearance (meters)	
	132 kV	220 kV
Minimum ground clearance at any point not over roads	6.7	7.0
Line conductor to road surface	6.7	7.4
Line conductor to high load route surface	7.5	8.5
Line conductors to railway crossings	8.0	8.2
To Cradle guards	4.0	4.0
To road surface where cradle guards can be used (Note 1)	8.8	9.8
Where power lines cross or are in close proximity (Note 2)	2.7	3.7
To any object on which a person may stand including ladders, access platforms etc. (Note 3)	3.6	4.6
To any object to which access is not required and on which a person cannot stand or lean a ladder (Note 3)	1.4	2.4
Support of upper line and any conductor of lower line	15.0	15.0
Survey and sagging error (Note 4)	0.3	0.3
To trees adjacent to line		
(i) Unable to support ladders/ climber	1.4	2.4
(ii) Capable of supporting ladder/ climber	3.6	4.6
(iii) Trees falling towards line with line conductors hanging vertically only	1.4	2.4

Note

1. These clearances are possible for situations where sky cradle can be used for conductor erection and maintenance. These clearances allow for the positioning of Sky cradle and erection of temporary scaffoldings under a live circuit.
2. Clearances shall be defined in a way that the upper conductor at its maximum temperature and coincides with the lower conductor, which at its minimum temperature and deflected by an angle of 450degrees.
3. Clearances shall be defined with the conductor at its specified maximum temperature and deflected by any angle up to 450 degrees.
4. To account for minor variations in ground topography and foundation installation, the transmission line profile shall be plotted with an additional clearance of 0.3m over those specified in the above table.

Annexure 2 Alternative Site Analysis for Grid Substations

T-1. - New Polpitiya-Hambantota 220 kV Transmission Development
New 220 KV Hambantota Grid Sub Station

S No	Description	Proposed Site
1.	Land Details	Proposed site
1.a	Area of land	4 ha
1.b	Slope/Plain land	Flat land
1.c	Approximate amount of land cutting required	Not required
2.	Ownership of land (Private / Forest/ Other Govt. Department/ Other)	Mahaweli Authority of Sri Lanka/ Govt. inside Managed Elephant Range as per Figure 11
3.	Private land (in ha.)	None
	(i) Agriculture - Irrigated - Non – irrigated	None
	(ii) Non - Agriculture/ Private Waste land.	Scrubland
	(iii) House or Building - Residential - Non – Residential	Non-residential
4.	Distance from nearest (With name)	
4.a	River (Name/Distance)	None
4.b	Highway	Hambantota- Gonnoruwa-Meegahajandura road
4.c	Forest Area	No forest, scrubland degraded
4.d	Village / town	Hambantota
4.e	Market/Area of Economic Activity	Hambantota
5.	Road accessibility	Gonnoruwa road
6.	EHV Line Passing Nearby (Distance)	Yes
7.	HT line Passing Nearby	Yes
8.	No. of Forest Trees :- - Trees to be felled - Trees to be lopped	No trees/ Shrubs only
9.	No. of private trees	None, Mahaweli land
	Fruit Trees: - Trees to be felled - Trees to be lopped	None
	Non - Fruit Trees: - Trees to be felled - Trees to be lopped	None
10.	Distance from mountaineous/coastal area	6 km to the coast
11.	Distance from cultivated area	1.6 km
12.	Altitude of GSS site	35 m
13.	Distance from nearest airport	11 km to Mattala Airport
14.	Distance from nearest religious or archaeological sites	17 km to Madunagala Aranya
	Alternative Selected	Selected

T-2. - Construction of Colombo B & C 132/11 kV Grid Substation

S No	Description	Colombo B	Colombo C
1	Land Details	Existing site	Existing site
1.a	Area of land	0.2 ha	0.75 ha
1.b	Slope/Plain Land	Flat terrain	Flat terrain
1.c	Approximate amount of land cutting required	None	None
2.	Ownership of land (private / forest/ Governemnt department/other)	CEB/ Govt.	CEB/ Govt.
3.	Private land (in ha.)	None	None
	(i) Agriculture - Irrigated - Non – irrigated		
	(ii) Non - Agriculture/ private waste land	None	None
	(iii) House or Building: - Residential - Non – Residential	Non-residential	Non-residential
4.	Distance from nearest (With name)		
4.a	River (Name/Distance)	Kelani River 3.5 km	Kelani River 1.5 km
4.b	Highway	A1, 130 m	A1, 1.3 km
4.c	Forest Area	None	None
4.d	Village / town	Pettah, Colombo city	Kotahena, Colombo city
4.e	Market/Area of Economic Activity	Colombo 11	Colombo 14
5.	Road accessibility	A1 road	A1 road
6.	EHV Line Passing Nearby (Distance)	Yes	Yes
7.	HT line Passing Nearby	Yes	Yes
8.	No. of Forest Trees - Trees to be felled - Trees to be lopped	None	None
9.	No. of private trees	None	None
	Fruit Trees: -Trees to be felled -Trees to be lopped	None	None
	Non - Fruit Trees: -Trees to be felled -Trees to be lopped	None	None
10.	Distance from mountainous/coastal area	Colombo harbour 660 m	Colombo harbour 1.4 km
11.	Distance from in cultivated area	--	--
12.	Altitude of GSS site	8 m	9 m
13.	Distance from nearest airport	30 km to Katunayaka Airport	25.7 km to Katunayaka Airport
14.	Distance from nearest religious or archaeological sites	Sri Sambuddaloka Viharaya 1.2 km	St' Lucia Cathedral 357 m
	Alternative Selected	Existing	Existing

T-3. - Augmentation of Biyagama, Kotugoda and Kolonnawa Old Grid Substations

S No	Description	Biyagama	Kotugoda	Kolonnawa
1	Land Details	Existing site	Existing Site	Existing site
1.a	Area of land	5 ha	3.5 ha	25 ha
1.b	Slope/Plain land	Flat terrain	Flat terrain	Flat terrain
1.c	Approximate amount of land cutting required	None	Not required	Not Required
2.	Ownership of land (private / forest/ Govt. department/ other)	CEB/ Govt.	CEB	CEB/Govt.
3.	Private land (in ha.)	None	None	None
	(i) Agriculture - Irrigated - Non – irrigated			
	(ii) Non - Agriculture/ Private Waste land	None	None	None
	(iii) House or Building: -Residential -Non – Residential	Residential area	Residential area	Residential area
4.	Distance from nearest (With name)			
4.a	River (Name/Distance)	Kelani River 4.9 km	Muthurajawela Marsh 3.4 km, Negumbo lagoon 3.1 km	Kelani River 2.3 km
4.b	Highway	Colombo-Katunayaka Expressway (0.56 km)	Colombo-Katunayaka Expressway (5.9 km)	Baseline road 0.5 km
4.c	Forest Area	None	Muthurajawela wetland 6.3 km	None
4.d	Village / town	Makola, Biiyagama	Ja Ela	Dematagoda, Kolonnawa
4.e	Market/Area of Economic Activity	Kiribathgoda	Ja Ela	Dematagoda
5.	Road accessibility	Kiribathgoda-Biyagama road	Colombo-Katunayaka Ja Ela road, Colombo-Katunayake expressway	Base line road-Kolonnawa
6.	EHV Line Passing Nearby (Distance)	Yes	Yes	Yes
7.	HT line Passing Nearby	Yes	Yes	Yes
8.	No. of Forest Trees :- -Trees to be felled -Trees to be lopped	None	None	None
9.	No. of private trees	None	None	None
	Fruit Trees: -Trees to be felled -Trees to be lopped	None	None	None

S No	Description	Biyagama	Kotugoda	Kolonnawa
	Non - Fruit Trees: -Trees to be felled -Trees to be lopped	None	None	None
10.	Distance from coastal/ mountainous area	12 km to the coast	10.2 km to the coast	4.8 km to the coast
11.	Distance from in cultivated area	3.2 km	900 m paddy lands	7.3 km paddy lands
12.	Altitude of GSS site	34 m	10 m	7 m
13.	Distance from nearest airport	24 km to Katunayaka Intl. Airport	6 km to Katunayake Intl. Airport	28 km to Katunayaka air port
14.	Distance from nearest religious or archaeological sites	4.7 km to Kelaniya temple	Raddolugama mosque 3.2 km	4.5 km to Kelaniya temple
	Alternative	selected	selected	Selected

T-5. - Construction of Biyagama 220/33 kV Grid Substation

S No	Description	Existing Site
1.	Land Details	Existing site
1.a	Area of land	5 ha
1.b	Slope/plain land	Flat terrain
1.c	Approximate amount of land cutting required	None
2.	Ownership of land (private / forest/ govt. department/ Other)	CEB/ Govt.
3.	Private land (in ha.)	None
	(i) Agriculture :- - Irrigated - Non – irrigated	
	(ii) Non - Agriculture/ private waste land.	None
	(iii) House or Building: - Residential - Non – Residential	Residential area
4.	Distance from nearest (With name)	
4.a	River (Name/Distance)	Kelani River 4.9 km
4.b	Highway	Colombo- Katunayaka Expressway (0.56 km)
4.c	Forest Area	None
4.d	Village / town	Makola, Biiyagama
4.e	Market/Area of Economic Activity	Kiribathgoda
5.	Road accessibility	Kiribathgoda- Biyagama road
6.	EHV Line Passing Nearby (Distance)	Yes
7.	HT line Passing Nearby	Yes
8.	No. of Forest Trees : - Trees to be felled - Trees to be lopped	None
9.	No. of private trees	None
	Fruit Trees: - Trees to be felled	None

S No	Description	Existing Site
	- Trees to be lopped	
	Non - Fruit Trees: - Trees to be felled - Trees to be lopped	None
10.	Distance from mountainous/coastal area	12 km to the coast
11.	Distance from the cultivated area	3.2 km
12.	Altitude of GSS	34 m
13.	Distance from nearest airport	24 km to Katunayaka Intl. Airport
14.	Distance from nearest religious or archaeological sites	4.7 km to Kelaniya temple
	Alternative Selected	selected

T-6. - Augmentation of Dehiwala Grid Substation

S No	Description	Existing Site
1.	Land Details	Existing GSS land
1.a	Area of land	0.3 ha
1.b	Slope/plain land	Plain land
1.c	Approximate amount of land cutting required	None
2.	Ownership of land (private / forest/ govt. department/ Other)	CEB/ Govt.
3.	Private land (in ha.)	None
	(i) Agriculture :- - Irrigated - Non – irrigated	None
	(ii) Non - Agriculture/ private waste land.	
	(iii) House or Building: - Residential - Non – Residential	GSS is in the middle of residential area
4.	Distance from nearest (With name)	
4.a	River (Name/Distance)	Weres Ganga 1.8 km
4.b	Highway	1.2 km to Galle Road, A2
4.c	Forest Area	Bellanwila Attidiya Bird Sanctuary (1.9 km)
4.d	Village / town	Attidiya, Dehiwala
4.e	Market/Area of Economic Activity	Dehiwala
5.	Road accessibility	Maharagama-Dehiwala road
6.	EHV Line Passing Nearby (Distance)	Yes
7.	HT line Passing Nearby	Yes
8.	No. of Forest Trees : - Trees to be felled - Trees to be lopped	None
9.	No. of private trees	None
	Fruit Trees: - Trees to be felled - Trees to be lopped	
	Non - Fruit Trees: - Trees to be felled	None

S No	Description	Existing Site
	- Trees to be lopped	
10.	Distance from mountainous/coastal area	1.8 km to the sea
11.	Distance from the cultivated area	2 km
12.	Altitude of GSS	7 m
13.	Distance from nearest airport	2.4 km to Ratmalana air port
14.	Distance from nearest religious or archaeological sites	1.3 km to Bellanwila temple
	Alternative Selected	selected

T-8. - Augmentation of Madampe 132/33 kV Grid substation

S No	Description	Existing Site
1.	Land Details	Existing Site
1.a	Area of land	1 ha Approx.
1.b	Slope/plain land	Flat terrain
1.c	Approximate amount of land cutting required	None
2.	Ownership of land (private / forest/ govt. department/ Other)	Government
3.	Private land (in ha.)	
	(i) Agriculture :- - Irrigated - Non – irrigated	
	(ii) Non - Agriculture/ private waste land.	
	(iii) House or Building: - Residential - Non – Residential	Residential
4.	Distance from nearest (With name)	
4.a	River (Name/Distance)	4.2 km Maha oya
4.b	Highway	B 247, Kurunegala road
4.c	Forest Area	None
4.d	Village / town	Suduwella
4.e	Market/Area of Economic Activity	Urban
5.	Road accessibility	B 247
6.	EHV Line Passing Nearby (Distance)	Yes
7.	HT line Passing Nearby	Yes
8.	No. of Forest Trees : - Trees to be felled - Trees to be lopped	None
9.	No. of private trees	None,
	Fruit Trees: - Trees to be felled - Trees to be lopped	
	Non - Fruit Trees: - Trees to be felled - Trees to be lopped	None
10.	Distance from mountainous/coastal area	8 km to the coast
11.	Distance from the cultivated area	1 km paddy fields
12.	Altitude of GSS	16 m

S No	Description	Existing Site
13.	Distance from nearest airport	36 km, Katunayake International Airport
14.	Distance from nearest religious or archaeological sites	16 km Sri Devagiri Rajamaha Viharaya
	Alternative Selected	Selected

Annexure 3 Alternative Route Analysis for Transmission Lines

T-1. - New Polpitiya-Hambantota 220 kV Transmission Development

SNo	Description	Proposed Option
1.	Length of line	144 km
2.	Canal / River crossings	Kelani river between AP 1-2, Madagal Oya between AP 22-23, Kuru Ganga between AP 35-36, Walawe river between AP 73-74, Walawe River between AP 134-135, Walawe River between AP 138-139, Walawe River between AP 152-153
3.	(i) Forest/ scrublands Area (ha)	(i) 89.1 ha
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii)
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Gilimale Forest Reserve, 800 m (south of the line, near AP 47) Peak Wilderness Sanctuary (800 m, east of the line, near AP 28; 200 m north of the line near AP35, 500 m, north of the line near Mapalana Water fall and AP 46, 1.5 km north of the line near AP 52, 500 m north of the line near AP 54) Bambarabotuwa Forest Reserve 3.5 km (south) UdaWalawa National Park 600 m east of the line from the AP128, UdaWalawa Reservoir 1.2 km east of the line from AP 129 &130) Madunagala Sanctuary 100 m south west of the line near AP 169 & 170
4.	Development of Tower sites - Number of towers - Land to be acquired for tower bases	Angle Towers- 183, Suspension Towers- 193 4.12 ha for angle towers (15x15m), 2.78 ha for suspension towers (12x12 m)
5.	Land Strata	Home gardens, Tea plantations, Rubber plantations, Mountainous areas, Secondary forests, Paddy fields, Coconut plantations, Scrublands, Sugar Cane plantations, Teak plantations, Banana cultivations, Vegetable cultivations
6.	Road accessibility	Kithulgala- Ginigathhena road for AP 1 Maliboda road for 22 Malwala-Siripagama Road for 41,42 A4 road for 80,81,82 Wikiliya road for 92 Weligepola-Handagiriya road for 98,99,100 B427 road for 132 Embilipitiya –Moraketiya road for 140,141 Sooriyawewa-Padalangala road for 159 Hambantota –Gonnoruwa road for 183

SNo	Description	Proposed Option
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: a) Residential b) Non-Residential	 a) 79.76 ha home gardens 285.67 ha agricultural lands
8.	220 kV/132 kV transmission line crossing	220 kV line cross between 1-2, 132 kV line cross between 1-2, 91-92, 97-98,
9.	33 kV/11 kV line crossings	33 kV line cross between 12-13, 41-42, 57-58, 67-68, 106-107, 119-120, 120-121, 126-127
10.	Road crossing	Maliboda road 22-23 Malwala-Siripagama Road 41-42 A4 road 80-81 Karadiyamulla road 82-83 Wikiliya road 91-92 Waligepola-Handagiriya road 98-99 Hatangala road 106-107 B427 road 131-132 Embilipitiya –Moraketiya road 140-141 Sooriyawewa-Padalangala road 159-160 B562 road 171-172 Erathna – Deraniyagala road 32-33 Adavikanda- Guruluwana road 35-36
11.	National Highway/Major road Crossing	A4 road 80-81 Balangoda- Badulla road
12.	Telephone line crossing	> 20 times
13.	Length of line passing in the forest area/coastal area/national park/sanctuary	1.41 km in
14.	No. of Forest Trees :- a) (a) Trees to be felled b) (b) Trees to be lopped	370
15.	No. of private trees (i) (1) Fruit Trees: a) (a) Trees to be felled b) (b) Trees to be lopped (ii) (2) Non-Fruit Trees: a) (a) Trees to be felled b) (b) Trees to be lopped	Coconut 1124, Mango 13, Duriyan 4, Jak 111, Del 9 Teak 1027, Rubber 589 Other trees 2142
16.	Length of line in (a) marshy area (b) water bodies	0.35 km
17.	Length of line in paddy /agricultural area	81.62 km
18.	Length of line in home garden	22.79 km

SNo	Description	Proposed Option
	area	
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	24.05 km
20.	Highest altitude en-route the line	822 m between 60-91
21.	Nearest distance from coast/port and airports	10.19 km to Mattala Airport 5.61 km to Sea
22.	Nearest distance from various receptors and major installations	See table
23.	Distance from nearest religious or Archaeological sites	Sri Purwaramaya, Karawilayaya 100m to AP 119-120
24.	Name of villages involved/ Name of Province	Polpitiya, Kohowlakanda, Paratalawa, Pitakanda,, Polgaswatta, Galgodahena, Iriyatenna, Maliboda, Vissena, Yatiwala, Peripatta,Erathna, Muruththettukanda, Gangabada, Adavikanda, Paladeniya, Dehigahahena, Diviyagala, Carney, Mahawatta, Sri Palabaddala, Mapalana, Kudawa, Rathganga, Polwatta, Dehenakanda, Alupola, Lower Opiel, Halwaturukanda, Raassagala, Durakanda, Uwella, Polwathugoda, Idirimanagoda, Welekubura, Hiriketiya, Wijanathkubura, Atawakwela, Morahelawatta, Weedagama, Weliharanawa, Olugantota, Karadiyamulla, Gattaraluwa, Hapugahakumbura, Walakumbura, Aldora, Dambagahaliyedda, Teladiriya, Pollamura, Urawala, Kottibuwala, Kandewela, Pussatota, Diloya, Kudaoya, Karawilayay, Galpaya, Light road, Panahaduwa, Karamati ara, Malabotu ara, Mudunmalkada, Rathkarawwa, Koul ara, Moraketiya, Halmillakatiya, Thunkama, Therunnansegama, Therunkatuwagama, Kurugamketiya, Halporuwa, Aliolu ara,Siripura, Viharagala, Sampathgama, Namedagaswewa, Hastipura, Adihama, Buruthakanda, Karuwala wewa, uswewa, Bellagas wewa, Pathlayapura, Tissagama, Gonnoruwa
25	Land to be permanently acquired: a) Area (in ha) Cost.	None

T-4. - Padukka – Horana 132 kV Transmission Development

Construction of 132 kV 23 km from Padukka GSS – Horana GSS Transmission line

SNo	Description	Proposed Option
1.	Length of line	23.7 km
2.	Canal / River crossings	One small canal between AP41 and AP42
3.	(i) Forest/ scrublands Area (ha)	None
	(ii) Wildlife Sanctuary/National Park (in ha)	None
	(iii) Distance from nearest Wildlife sanctuary/ National	8.7 km to Labugama-Kalatuwawa Forest Reserve

SNo	Description	Proposed Option
	Park /Forests reserves	
4.	Development of Tower sites - Number of towers - Land to be acquired for tower bases	 Angle Towers- 57 , Suspension Towers- 17 1.26 ha for angle towers (15x15m), 0.24 ha for suspension towers (12x12 m)
5.	Land Strata	Paddy fields, Home gardens, Rubber plantations, Coconut plantations
6.	Road accessibility	AP14-17 Padukka (B240) Road AP1- Nawalamulla road AP10 – A4 road AP 27-Padukka – Horana (B123) Road, AP 52-53- A8 road
7.	Private land (in ha.) (i) Agriculture: - a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: c) Residential d) Non-Residential	 (i) 60.36 ha paddy fields (a) 10.56 ha home gardens
8.	220 kV/132 kV transmission line crossing	 No
9.	33 kV/11 kV line crossings	Between AP5 & AP6, AP12 & AP13, AP13 & AP14, AP14 & AP15, two crossings AP15 & AP16, Two crossings AP 18 & AP19, AP26 & AP27, AP36 & AP37, AP50 & AP51
10.	Road crossing	Meegoda – Artigala Road AP 9-10 Colombo- Avissawella Road AP 11-12 Padukka- Godagama Road AP 14-15,16- 17, 22- 23 Galagedara –Horana Road AP24- 25 Poruwadanda- Hadapangoda Road AP 38-39 Horana – Ratnapura Road AP 52-53
11.	National Highway/Major road Crossing	A8 road (AP52-53) A4 road (AP11-12)
12.	Telephone line crossing	
13.	Length of line passing in the forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- c) (a) Trees to be felled d) (b) Trees to be lopped	The line passes through home gardens and paddy fields. No forest trees are found, only the few trees in home gardens and trees adjacent to the paddy lands.
15.	No. of private trees (iii) (1) Fruit Trees: c) (a) Trees to be felled d) (b) Trees to be lopped (iv) (2) Non-Fruit Trees: c) (a) Trees to be felled d) (b) Trees to be lopped	 (1) Coconut – 256, Aricanut – 135, Jak – 9, Kottamba – 14, Kithul – 5, Rambutan- 3, Katupol – 12, (2) 680

SNo	Description	Proposed Option
16.	Length of line in (a) marshy area (b) water bodies	None
17.	Length of line in paddy /agricultural area	20.12km
18.	Length of line in home garden area	3.52km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(a) none (b) none
20.	Highest altitude en-route the line	between AP45-AP46 53 m
21.	Nearest distance from coast/port and airports	21.28 km to Coast 37.7 km to Katunayake Air port
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious or Archaeological sites	450m from Sri Sammatharamaya near AP3-4
24.	Name of villages involved/ Name of Province	Batawala, Nawalamulla, Meegodadeniya ,Panaluwa, Meegoda, Galabedihena, Koshena, Watareka, Thuthtiripitiya, Liyanwala, Padukka, Pore gedara, Kotigamgoda, Maguruwila, Malagala, Kahawala, Panangala, Pahurugala, Maputugala, Diklanda, Alubohena, Poruwadanda, Galwatigodella Western Province
25	Land to be permanently acquired: b) Area (in ha) Cost.	None

Annexure 4 Inventorisation along the Transmission Lines

T-1. - New Polpitiya-Hambantota 220 kV Transmission Development

220 kV transmission line from Polpitiya to Hambantota (144 km) and Photographs

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
1	2	0.73	0.04	Pitawala, Polpitiya	Nuwara Eliya	1,1	369	2.55	CEB	Home gardens, Tea plantation, Rubber plantation (line crossed 220/132 kV line - Laxapana GSS,Kelani river)	Rubber	70
											Kithul	5
											Jak	5
2	3	0.47	0.13	Pitawala, Polpitiya	Nuwara eliya	1,0	225	1.64	Private	Home gardens, Rubber plantation (line near Valahena, Polpitiya Vidyalaya-200m)	Kithul	11
											Rubber	130
											Coconut	12
											Jak	6
3	4	0.36	0.06	Polpitiya	Nuwara eliya	1,0	225	1.26	Private	Home gardens(Angle point 3 is located near a house, Sumana Sri Bodirajaramaya/Saman Dewalaya-130m)	Kithul	7
											Coconut	2
											Jak	8
											Areca nut	4
4	5	0.24	0.05	Polpitiya	Nuwara eliya	1,0	225	0.84	Private	Home gardens (line goes near a house)	Jak	2
											Rubber	2
											Kithul	6
											Areca nut	10
											Coconut	1
											Ratadel	1
											Milla	2
											Katukithul	6
											Alstonia	1
5	6	0.64	0.07	Polpitiya	Nuwara eliya	1,1	369	2.24	Private	Home gardens	Kithul	3
											Gorok	2
											Alipera	1
											Waldel	2
											Milla	1
											Mahogany	1
											Rubber	3
											Jak	2
											Sapu	1
											Other trees	35
											Alstonia	2
6	7	0.28	0.03	Kohowilakanda, Parathalawa	Nuwara eliya	1,0	225	0.98	Private	Home gardens (line near a house)	Jak	7
											Rubber	21
											Sapu	2
											Kithul	8
											Coconut	10
											Areca nut	16
											Ratadel	1
											Milla	1
											Mango	1
7	8	0.76	0.15	Hitigegama	Nuwara eliya	1,1	369	2.66	Private	Home gardens, 2ry forest	Ratadel	1
											Mahogany	1
											Duriyan	1
											Other trees	53
											Areca nut	3

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
8	9	0.58	0.27	Pitakanda	Nuwara eliya	1,0	225	2.03	Government	Secondary forest (cannot access to the point 9)	Other trees	27
9	10	2.06	0.12	Pitakanda	Kegalle	1,5	945	7.21	Private & Government	Home gardens, line near Samanala nature reserve	Jak	7
											Other trees	123
											Duriyan	1
											Mahogany	5
											Kithul	3
10	11	0.28	0.06	Gomala,Polgaswatta	Kegalle	1,0	225	0.98	Private	Home gardens	Jak	2
											Mahogany	2
											Kithul	4
											Duriyan	1
											Coconut	2
											Rubber	25
11	12	0.35	0.05	Polgaswatta	Kegalle	1,0	225	1.25	Private	Home gardens/paddy fields(line goes near a house)	Jak	1
											Areca nut	11
											Duriyan	1
											Mahogany	2
											Coconut	5
12	13	0.33	0.06	Polgaswatta	Kegalle	1,0	225	1.15	Private	Home gardens/ tea plantations(line crossed 33 kV line and road)	Jak	3
											Lunumidella	2
											Alstonia	2
											Mango	1
											Mara	3
											Coconut	3
											Kithul	1
13	14	0.91	0.04	Kodihela	Kegalle	1,1	369	3.18	Private	Tea small holding/ Home garden	Other trees	52
14	15	0.4	0.15	Galgodahena	Kegalle	1,0	225	1.4	Private	Rubber land	Rubber	46
15	16	0.78	0.03	Iriyatenna	Kegalle	1,1	369	2.73	Private	Home garden/ secondary forest	Other trees	33
										Abandoned tea land		
16	17	0.36	0.04	Iriyatenna	Kegalle	1,0	225	1.26	Private	Rubber land /mixed vegetation	Rubber	16
											Other trees	4
17	18	0.35	0.02	Pandiela,Malimboda	Kegalle	1,0	225	1.22	Private	Tea land/home garden	Other trees	12
18	19	0.39	0.05	Maliboda	Kegalle	1,0	225	1.36	Private	Home garden	Other trees	13
19	20	0.51	0.05	Maliboda	Kegalle	1,0	225	1.78	Private	Coconut estate	Coconut	20
20	21	0.53	0.05	Maliboda	Kegalle	1,0	225	1.85	Private	Coconut estate	Coconut	28
21	22	0.69	0.05	Maliboda	Kegalle	1,1	369	2.41	Private	Mixed vegetation	Other trees	86
22	23	0.94	0.08	Maliboda estate	Kegalle	1,1	369	3.29	Private	Tea land/ home garden (cross Madagal Oya, Maliboda road)	Other trees	106
23	24	0.46	0.05	Poddenikanda, Vissena	Kegalle	1,0	225	1.61	Private	Tea land/ home garden	Other trees	13
24	25	0.31	0.02	GerandimalaAtula, Yatiwala	Kegalle	1,0	225	1.08	Private	Tea land/ home garden	Other trees	18
25	26	0.98	0.04	Peripalla, Magala		1,2	513	3.43	Private	Tea land/ home garden	Other trees	58
										Alstonia dominated area		
26	27	0.39	0.03	Peripalla	Kegalle	1,0	225	1.36	Private	Tea land/ home gardens	Other	26

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
											trees	
27	28	0.89	0.1	Peripalla	Kegalle	1,1	369	3.11	Private	Tea land/ home garden Degraded vegetation	Other trees	38
28	29	0.52	0.06	Peripalla	Kegalle	1,0	225	1.82	Private	Tea small holding	Other trees	35
29	30	0.89	0.04	Bate,Erathna	Ratnapura	1,1	369	3.11	Private	Tea small holding Home garden/ mixed sp vegetation	Other trees	74
30	31	1.12	0.02	Murethththettukanda	Ratnapura	1,2	513	3.92	Private	Tea land/ home garden	Other trees	68
31	32	0.58	0.03	Murethththettukanda	Ratnapura	1,0	225	2.03	Private	Tea land, Home garden	Other trees 29	
32	33	0.66	0.02	Gangabada, Erathna	Ratnapura	1,1	369	2.31	Private	Degraded vegetation (Line crosses Eratna- Deraniyagala road between AP32- AP33)	Other trees	53
33	34	0.77	0.06	Adavikanda	Ratnapura	1,1	369	2.69	Private	Tea small holding	Other trees	57
34	35	0.62	0.07	Adavikanda	Ratnapura	1,1	369	2.17	Private	Home gardens	Other trees	61
35	36	0.75	0.07	Adavikanda South	Ratnapura	1,1	369	2.62	Private	Home garden, Mixed Vegetation (Line crosses Adavikanda-Guruluwana road between AP 35- AP 36, cross a stream)	Other trees	42
36	37	0.5	0.05	Paladeniya, Adavikanda	Ratnapura	1,0	225	1.75	Private	Tea land/ home garden	Other trees	20
37	38	1.83	0.22	Dehogahahena	Ratnapura	1,4	801	6.4	Private	Tea small holding, 2ry forest area	Other trees	108
38	39	0.96	0.02	Dehigahahena	Ratnapura	1,2	513	3.36	Private	2ry forest patch area, point 39 located in small tea plantation	Jak	2
											Other trees	45
											Alstonia	2
											Shorea sp.	4
39	40	1.04	0.1	Diviyagala	Ratnapura	1,2	513	3.64	Private	Young Coconut plantation, Home gardens	Areca nut	4
											Young Coconut	23
											Shorea sp.	2
											Hora	1
											Mara	1
											Jak	1
											Kithul	1
											Albizia	1
40	41	1.32	0.13	Diviyagala	Ratnapura	1,2	513	4.62	Private	Home gardens, Tea plantation	Mara	1
											Jak	1

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
											Other trees	29
											Durian	1
											Wal del	1
41	42	0.27	0.04	Carney Estate	Ratnapura	1,0	225	0.94	Private	Point located in tea plantation (Line cross 33 kV line)	Coconut	9
											Alstonia	1
											Pulun	1
											Waldel	1
											Areca nut	4
											Rubber	1
											Jak	7
											Gadiguda	2
											Rambutan	1
											Kithul	3
											Mango	1
42	43	0.26	0.01	Mahawatta,Sri Palabaddala	Ratnapura	1,0	225	0.91	Private	Point located in tea plantation (Line near Sripada central college -180m/Sripada entrance)	Kithul	3
											Coconut	5
											Areca nut	10
											Jak	4
43	44	0.47	0.07	Sri palabaddala	Ratnapura	1,0	225	1.64	Private	Tea plantation, Home gardens	Alstonia	1
											Areca nut	2
											Albizia	1
											Jak	2
											Kithul	1
											Mango	1
44	45	0.71	0.11	Rakwata, Mapalana	Ratnapura	1,1	369	2.48	Private	Home garden	Jak	5
											Other trees	21
											Coconut	8
											Kithul	3
											Areca nut	2
45	46	0.58	0.04	Mapalana	Ratnapura	1,0	225	2.03	Private	Home gardens, Tea plantation, Mapalana Ella Waterfall area	Coconut	3
											Areca nut	3
											Mango	1
											Kithul	2
46	47	0.95	0.03	Mapalana	Ratnapura	1,2	513	3.32	Private	Home gardens	Rata del	1
											Areca nut	5
											Jak	4
											Kithul	1
47	48	2.26	0.07	Mapalana	Ratnapura	1,5	945	7.91	Private	Home gardens, Tea plantation	Kithul	5
											Other trees	58
											Shorea sp.	1
											Wal del	1
											Na Imbul	1
48	49	1.36	0.02	Kudaawa,Rathganga	Ratnapura	1,3	657	4.76	Private	Home gardens, T plantation	Hora	2
											Other	85

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
											trees	
											Mahogany	4
											Jak	5
											Areca nut	11
											Bukanda	1
											Kithul	4
											Alstonia	6
49	50	1.03	0.05	Polwatta,Rathganga	Ratnapura	1,2	513	3.6	Private	Home gardens, Tea plantation(cross 240V line)	Other trees	61
50	51	1.59	0.05	Rathganga	Ratnapura	1,3	657	5.56	Government	2ry forest area, Tea plantation	Other trees	75
51	52	0.97	0.06	LRG Division, Lower Rathganga	Ratnapura	1,2	513	3.39	Private	Tea plantation (cross Gokxing falls stream)	Sabukku	2
52	53	0.25	0.03	Dehenakanda, Gallalla	Ratnapura	1,0	225	0.87	Private	Tea plantation (line near Rathganga Tamil School, Sri Vigneshwara Vidyalaya, Dehenakanda Temple)	Sabukku	38
											Eucalyptus	5
											Jak	1
53	54	1.17	0.07	Dehenakanda	Ratnapura	1,2	513	4.09	Private	Home gardens, Tea plantation (line near to a house)	Bukanda	1
											Sabukku	10
											Jak	1
											Eucalyptus	4
54	55	1.28	0.11	KambiAdiya	Ratnapura	1,2	513	4.48	Private	Home gardens, Tea plantation (cannot acess to point 55)	Other trees	35
55	56	0.9	0.2	Bambarakanda	Ratnapura	1,2	513	3.15	Private	Home gardens	Coconut	3
											Areca nut	5
											Other trees	23
56	57	0.84	0.1	Alupola Estate	Ratnapura	1,1	369	2.94	Private	Home gardems Tea plantation (mountainous area)	Kithul	
											Shorea	
											No trees	
57	58	0.49	0.1	Alupola Estate	Ratnapura	1,0	225	1.71	Private	T plantation (mountainous area,line crossed 33 kV line, near Alupola Ella)	Other trees	2
58	59	0.51	0.16	Alupola Estate	Ratnapura	1,0	225	1.78	Private	Tea plantation (mountanious area)	Coconut	15
59	60	0.87	0.19	Lower Opiel, Alupola estate	Ratnapura	1,1	369	3.04	Private	Tea plantation	Coconut	3
60	61	2.82	0.23	Halhathurukanda	Ratnapura	1,7	1233	9.87	Private	Tea plantation - Akkara 50 (line near to Wewalwatta Tamil school, Wallawa Mukalana Tamil school)	No trees	
61	62	1.28	0.06	Halhathurukanda	Ratnapura	1,2	513	4.48	Private	Home gardens	Mara	1
											Kithul	2
											Jak	2
62	63	1.66	0.06	Durakanda,Uwalla	Ratnapura	1,3	657	5.81	Private	Tea plantation (Valley area), Young rubber plantation (Samanpura Siddartha Vidyalaya)	Jak	1

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
											Areca nut	5
63	64	0.17	0.01	Polwatte,Rassagala	Ratnapura	1,0	225	0.59	Private	Tea plantation (Valley area)	Areca nut	10
64	65	0.33	0.05	Polwatte,Rassagala	Ratnapura	1,0	225	1.15	Private	Abundance Paddy area	No trees	
65	66	0.34	0.07	Idirimanagoda, Rassagala	Ratnapura	1,0	225	1.19	Private	Paddy fields	Coconut	3
66	67	0.56	0.04	Rassagala	Ratnapura	1,0	225	1.96	Private	Paddy fields (Rassagala Rural hospital, Rassagala Tamil school, St.Fransis Xavier church)	No trees	
67	68	0.39	0.03	Welekubura	Ratnapura	1,0	225	1.36	Private	Paddy fields, Home gardens (cross Walaboda road,33 kV line)	Alstonia	6
											Coconut	4
											Jak	2
											Areca nut	7
											Mango	2
68	69	2.25	0.03	Welekubura	Ratnapura	1,5	945	7.87	Private	Unable to access (near to Welekubura Tamil school)		
69	70	0.3	0.03	Wijanathkubura	Ratnapura	1,0	225	1.05	Private	Tea plantation, Home gardens	Jak	3
											Lunumidella	3
											Mara	1
											Coconut	1
											Kithul	1
											Sapu	1
											Mango	2
											Weralu	1
70	71	0.27	0.04	Wijanathkubura	Ratnapura	1,0	225	0.94	Private	Tea plantation	Albizia	2
											Jak	3
											Sapu	1
71	72	0.29	0.01	Wijinathkubura	Ratnapura	1,0	225	1.01	Private	Tea plantation	Jak	2
72	73	0.46	0.03	Wijinathkubura	Ratnapura	1,0	225	1.61	Private	(near Wijinathkubura temple-42m)	Mara	1
											Boo	1
73	74	0.29	0.05	Wijinathkubura	Ratnapura	1,0	225	1.01	Government	Scrubland (cross Walawe river)	No trees	
74	75	0.43	0.03	Atawakwela	Ratnapura	1,0	225	1.5	Private	Tea plantation	No trees	
75	76	1.18	0.05	Morahela	Ratnapura	1,2	513	4.13			Mahogany	3
											Kithul	1
76	77	0.57	0.8	Morahelawatta, Widagama	Ratnapura	1,0	225	1.99	Private	Home gardens, Scrubland	Alstonia	1
											Sapu	1
											Mango	1
											Jak	5
											Areca nut	1
77	78	0.71	0.03	Widagama	Ratnapura	1,1	369	2.48	Private	Tea plantation (mountainous area)	Alstonia	2
78	79	0.63	0.02	Niwasipuram	Ratnapura	1,1	369	2.2	Private	Tea plantation , Home gardens(mountainous area)	Coconut	14
79	80	0.83	0.11	Bandaragama	Ratnapura	1,1	369	2.9	Private	Coconut plantation, Scrubland	Coconut	79
											Jak	2

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
											Kanda	1
80	81	0.3	0.03	Olugantota	Ratnapura	1,0	225	1.05	Private	Paddy fields (line cross A4 road)	No trees	
81	82	0.47	0.03	Olugantota, Karadiyamulla	Ratnapura	1,0	225	1.64	Private	Home gardens, Paddy fields	Other trees	3
82	83	0.41	0.02	Gattaraluwa	Ratnapura	1,0	225	1.43	Private	Home gardens, Tea plantation (line crossed Karadiyamulla road, near a house)	Kithul	3
											Mahogany	2
											Alstonia	1
											Pulun	1
											Sapu	1
											Mango	1
											Ratadel	1
											Jak	4
											Coconut	4
83	84	1.74	0.02	Hapugahakubura	Ratnapura	1,4	801	6.09	Private	Tea plantation, Home gardens	Other trees	19
84	85	0.59	0.02	Hapugahakubura	Ratnapura	1,0	225	2.06	Private	Home gardens (cross a stream)	Other trees	8
85	86	0.6	0.02	Hapugahakubura	Ratnapura	1,0	225	2.1	Private	Rubber plantation	Rubber	110
86	87	0.46	0.23	Hapugahakubura	Ratnapura	1,0	225	1.61	Private	Rubber plantation	Rubber	75
87	88	0.75	0.03	Dambagahatenna	Ratnapura	1,1	369	2.62	Private	Rubber plantation, Scrubland	Rubber	90
88	89	1.02	0.1	Walakumbura	Ratnapura	1,2	513	3.57	Private	Scrubland	Other trees	14
89	90	0.34	0.15	Aldora	Ratnapura	1,0	225	1.19	Private	Scrubland	Other trees	1
90	91	0.3	0.03	Aldora	Ratnapura	1,0	225	1.05	Private	Scrubland	Other trees	3
91	92	0.34	0.05	Aldora	Ratnapura	1,0	225	1.19	Private	Home gardens (line crossed Wikiliya road,132 kV line, line near to Sri Nanda M.V-400m)	Jak	4
											Mahogany	1
											Coconut	1
											Teak	1
											Alipera	1
92	93	1.22	0.01	Dambagahaliyadda	Ratnapura	1,2	513	4.27	Private	Paddy fields, Home gardens, Scrubland	Coconut	38
											Other trees	20
93	94	1.12	0.03	Dambagahaliyadda	Ratnapura	1,2	513	3.92	Private	Home gardens, Scrubland	Coconut	9
94	95	0.38	0.02	Teldiriya	Ratnapura	1,0	225	1.33	Government	Forest area, Scrubland	Other trees	37
95	96	0.59	0.09	Teldiriya	Ratnapura	1,0	225	2.06	Private	Scrubland	Other trees	5
96	97	0.92	0.01	Teldiriya	Ratnapura	1,2	513	3.22	Private	Home gardens, 2ry forest	Other trees	23
97	98	0.42	0.04	Pollamura	Ratnapura	1,0	225	1.47	Private	Paddy fields , Edge of a home garden (cross 132 kV line)	Coconut	12
98	99	0.16	0.02	Pollamura	Ratnapura	1,0	225	0.56	Private	Home gardens, Paddy fields (cross Waligepola- Handagiriya road)	Other trees	54
99	100	0.13	0.08	Pollamura	Ratnap	1,0	225	0.45	Private	Paddy fields (line near to	No trees	

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
					ura					Weerasekara Vidyalaya,Pollamura)		
100	101	0.23	0.04	Pollamura	Ratnapura	1,0	225	0.8	Private	Home gardens	Other trees	14
101	102	0.38	0.1	Urawala	Ratnapura	1,0	225	1.33	Private	Coconut plantation, Scrubland	Coconut	12
											Other trees	6
102	103	0.58	0.13	Urawala	Ratnapura	1,0	225	2.03	Government	Forest area, Scrubland	Other trees	30
103	104	0.58	0.12	Urawala	Ratnapura	1,0	225	2.03	Government	Scrubland	Other trees	4
104	105	0.57	0.03	Kottibulwala	Ratnapura	1,0	225	1.99	Private	Home gardens (cross Yatipassagamuwa road, near Sri Bodirajaramaya,Urawala)	Jak	2
											Lunumidella	1
											Coconut	8
											Areca nut	30
105	106	0.48	0.04	Kottibulwala	Ratnapura	1,0	225	1.68	Private	Paddy fields, Home gardens(line near to Urawala Vidyalaya,Waligepola)	Other trees	14
106	107	0.43	0.04	Kottibulwala	Ratnapura	1,0	225	1.5	Private	Home gardens, Paddy fields (cross Hatangala road,33 kV line, line near to Kottibula Rajamaha Viharaya)	Coconut	9
107	108	0.45	0.01	Kandewela	Ratnapura	1,0	225	1..57	Private	Home gardens	Coconut	30
108	109	1.59	0.07	Pussatota	Ratnapura	1,3	657	5.56	Private	Coconut plantation, Scrubland	Coconut	50
											Other trees	45
109	110	1.08	0.05	Pussatota	Ratnapura	1,2	513	3.78	Private	Home gardens, Scrubland	Coconut	10
											Other trees	15
110	111	0.92	0.01	Pussatota	Ratnapura	1,2	513	3.22	Private	Coconut plantation, Paddy fields	Coconut	62
111	112	0.76	0.05	Pussatota	Ratnapura	1,1	369	2.66	Private	Home gardens, Paddy fields	Coconut	18
											Other trees	6
112	113	0.77	0.02	Dikoya	Ratnapura	1,1	369	2.69	Private	Coconut plantation, Paddy fields	Coconut	17
											Other trees	11
113	114	0.41	0.07	Kudaoya	Ratnapura	1,0	225	1.43	Private	Home gardens, Paddy fields (line crossed Kuda oya)	Kubuk	3
											Coconut	23
114	115	0.28	0.03	Karawilayaya	Ratnapura	1,0	225	0.98	Private	Home gardens, Paddy fields (line crossed Kuda oya)	Coconut	20
											Other trees	6
115	116	0.29	0.05	Karawilayaya	Ratnapura	1,0	225	1.01	Private	Home gardens	Coconut	8
											Other trees	6
116	117	0.48	0.03	Karawilayaya	Ratnap	1,0	225	1.68	Private	Coconut plantation	Coconut	68

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
					ura							
117	118	0.9	0.03	Karawilayaya	Ratnapura	1,1	369	3.15	Private	Coconut plantation, Paddy fields	Coconut	51
118	119	0.72	0.02	Galpaya	Ratnapura	1,1	369	2.52	Private	Home gardens, Scrubland	Coconut	8
											Mango	1
											Jak	1
											Teak	3
119	120	1.63	0.02	Karawilayaya	Ratnapura	1,3	657	5.07	Private	Home gardens (Vegetable cultivation ,line crossed two 33 kV lines ,line near Sri Purwaramaya, Karawilayay - 100m)	Coconut	11
120	121	1.84	0.03	Light road,Panahaduwa	Ratnapura	1,4	801	6.44	Private	Home gardens (Vegetable cultivation ,line parallel to 33 kV line)	Other trees	6
121	122	0.91	0.02	Light road,Panahaduwa	Ratnapura	1,2	513	3.18	Private	Home gardens, Coconut plantation (Vegetable cultivation)	Coconut	55
122	123	0.58	0.1	Light road,Panahaduwa	Ratnapura	1,0	225	2.03	Private	Home gardens, Coconut plantation (Vegetable cultivation)	Young Coconut trees	26
123	124	0.45	0.1	Karamati Ara	Ratnapura	1,0	225	1.57	Private	Home gardens (Manioc cultivation)	Teak	1
											Other trees	4
124	125	0.42	0.03	Karamati Ara	Ratnapura	1,0	225	1.47	Private	Home gardens, Coconut plantation	Coconut	45
											Kohomba	3
											Teak	2
125	126	0.3	0.01	Karamati Ara	Ratnapura	1,0	225	1.05	Private	Teak plantation	Young Teak trees	35
126	127	0.28	0.05	Karamati Ara	Ratnapura	1,0	225	0.98	Private	Home gardens (line crossed 33 kV line, near Panahaduwa preschool)	Coconut	7
											Teak	2
											Palu	1
											Kohomba	3
											Lunumidella	2
127	128	0.61	0.03	Karamati Ara	Ratnapura	1,0	225	2.13	Private	Home gardens	Coconut	74
128	129	1.85	0.02	Malabotu Ara	Ratnapura	1,4	801	6.47	Private	Teak plantation	Teak	30
129	130	0.73	0.03	Malabotu Ara	Ratnapura	1,1	369	2.55	Private	Teak plantation, Home gardens	Teak	250
130	131	0.58	0.02	Malabotu Ara, Udawalawa	Ratnapura	1,0	225	2.03	Private	Home gardens , Young Teak plantation (line near a house, cross B427 road)	Jak	1
											Coconut	16
											Mango	3
											Young Teak trees	330
											Teak	3
131	132	0.89	0.01	Mudunmalkada	Ratnapura	1,1	369	3.11	Private	Home gardens, Teak plantation	Teak	370
132	133	0.68	0.01	Rathkarawwa	Ratnapura	1,1	369	2.38	Private	Home gardens	Other trees	71
133	134	0.95	0.18	Rathkarawwa	Ratnap	1,2	513	3.32	Private	Scrubland, Sugar cane plantation	Other	6

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
					ura						trees	
134	135	2.45	0.06	Koul Ara north	Ratnapura	1,6	1089	8.57	Private	Home gardens, Sugar cane plantation (cross a canal)	Other trees	26
135	136	2.55	0.11	Kawantissapura	Monaragala	1,6	1089	8.92	Private	Sugar cane plantation, Scrubland	Other tree	19
											Welan	11
											Damba	6
136	137	1.6	0.03	Dalukketiya,Sewanagala	Monaragala	1,3	657	5.6	Private	Sugar cane plantation	No trees	0
137	138	1.06	0.31	Koul Ara	Monaragala	1,2	513	3.71	Private	Sugar cane plantation	No trees	0
138	139	0.77	0.08	D 2 canal, Kosmandiya, Moraketiya	Monaragala	1,1	369	2.69	Private	Sugar cane plantation (line crossed Walawe river, near Aranya Yograsramaya,Muthuminigama, Sewanagala-250m)	Kumbuk	3
											Coconut	3
139	140	0.89	0.02	5th Canal, Moraketiya	Hambantota	1,1	369	3.11	Private	Paddy/ Banana plantation	Other trees	3
140	141	0.75	0.02	6th Canal Moraketiya, near main road	Hambantota	1,1	369	2.62	Private	Paddy/ Banana plantation (cross Embilipitiya-Kiriibban Ara road)	Coconut	23
141	142	0.67	0.04	D7 Canal, Yaya 6, Moraketiya	Hambantota	1,0	225	2.34	Private	Paddy field	Coconut	15
142	143	0.54	0.02	D 7 Canal, Moraketiya	Hambantota	1,0	225	1.89	Private	Paddy filed	Coconut	7
143	144	0.79	0.06	D6 Canal, Halmillaketiya	Hambantota	1,1	369	2.76	Private	Banana plantation	Coconut	26
											Other trees	10
144	145	0.97	0.04	D 6 Canal, Halmillaketiya	Hambantota	1,2	513	3.39	Private	Banana plantation	Coconut	16
											Other trees	6
145	146	1.3	0.02	9th Canal, Thunkama	Hambantota	1,2	513	4.55	Private	Paddy/ Banana plantation	Coconut	6
146	147	0.6	0.01	10th Canal, Thunkama	Hambantota	1,0	225	2.1	Private	Banana plantation	Coconut	3
											Other trees	9
147	148	0.51	0.08	10th Canal, Thunkama	Hambantota	1,0	225	1.78	Private	Paddy field	Coconut	9
148	149	0.56	0.13	10th Canal, Therunnansegama	Hambantota	1,0	225	1.96	Private	Banana plantation	No trees	0
149	150	0.38	0.05	10th Canal, Therunnansegama	Hambantota	1,0	225	1.33	Private	Paddy field	Coconut	5
150	151	0.94	0.06	Therunkatuwagama	Hambantota	1,2	513	3.29	Private	Banana plantation	Coconut	7
151	152	1.03	0.06	Therunkatuwagama	Hambantota	1,2	513	3.06	Private	Paddy field	Coconut	4
152	153	0.79	0.04	Kurugamwetiya	Hambantota	1,1	369	2.76	Private	Paddy field (cross a river)	Coconut	14
											Other trees	20
153	154	0.59	0.03	D1, Hathporuwa	Hambantota	1,0	225	2.06	Private	Banana plantation	No trees	0
154	155	1.31	0.07	Hathporuwa	Hambantota	1,2	513	4.58	Private	Paddy field/ garden	Coconut	33
155	156	0.41	0.03	Aliolu Ara	Hambantota	1,0	225	1.43	Private	Paddy field (cross a canal)	Coconut	2
156	157	0.41	0.05	Aliolu Ara	Hamba	1,0	225	1.43	Private	Paddy field	Coconut	2

Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
					ntota							
157	158	1.04	0.09	Sirilpura	Hambantota	1,2	513	3.64	Private	Paddy field	Coconut	8
158	159	1.49	0.07	D6 Canal, Aliolu Ara	Hambantota	1,3	657	5.21	Private	Paddy field/ other gardens	Coconut	22
159	160	0.31	0.02	Viharagala, Nuge langa	Hambantota	1,0	225	1.08	Private	Home garden (cross Sooriyawewa- Padalangala road)	Other trees	6
160	161	0.25	0.03	Sampathgama	Hambantota	1,0	225	0.87	Private	Paddy field/ home gardens	Other trees	5
161	162	0.35	0.05	Sampathgama	Hambantota	1,0	225	1.22	Private	Paddy field	Coconut	2
162	163	0.61	0.06	Yaya 3, Viharagala	Hambantota	1,0	225	2.13	Private	Paddy field	Coconut	2
163	164	0.57	0.02	250 Yaya, Beddewewa-west	Hambantota	1,0	225	1.99	Private	Paddy field	Coconut	3
											Other trees	4
164	165	1.03	0.06	Namedagaswewa	Hambantota	1,2	513	3.06	Private	Banana plantation	Coconut	11
165	166	0.36	0.04	Namedagaswewa	Hambantota	1,0	225	1.26	Private	Paddy field	Other trees	6
									Private	Paddy field/ gardens	Other trees	11
166	167	0.49	0.11	Namedagawewa, near Madunagala road	Hambantota	1,0	225	1.71	Private	Paddy field/ gardens	Other trees	11
167	168	0.28	0.27	Namedagawewa, near Madunagala road	Hambantota	1,0	225	0.98	Private	Banana plantation	Other trees	4
168	169	0.41	0.01	Hasthipura, Namedagaswewa	Hambantota	1,0	225	1.43	Private	Banana plantation	Other trees	10
169	170	1.37	0.11	8th Post, Maha Ara	Hambantota	1,3	657	4.79	Private	Banana/ paddy filed	Other trees	15
170	171	0.93	0.1	Andigama	Hambantota	1,2	513	3.25	Private	Papaw plantation	Other trees	8
171	172	0.79	0.06	Buruthankanda	Hambantota	1,1	369	2.76	Private	Paddy filed (cross B562 road)	Other trees	5
172	173	0.47	0.12	Buruthankanda	Hambantota	1,0	225	1.64	Private	Banana plantation/ vegetable plot	Other trees	5
173	174	0.7	0.05	Buruthankanda	Hambantota	1,1	369	2.45	Private	Banana plantation	Other trees	6
174	175	2.02	0.52	Kaluwara wewa	Hambantota	1,5	945	7.07	Private	Coconut/ Mango plantation	Coconut	17
175	176	3.9	0.65	Bellagas wewa, Uswewa No. 31	Hambantota	1,10	1665	13.65	Private	Mango plantation	Other trees	12
176	177	0.53	0.35	Bellagas wewa, Uswewa No. 31	Hambantota	1,0	225	1.85	Government	Scrubland	Other trees	1
177	178	1.3	0.61	Bellagas wewa,	Hambantota	1,3	657	4.55	Government	Scrubland	Other trees	8
178	179	1.11	0.02	Pathalayagama	Hambantota	1,2	513	3.88	Government	Scrubland	Other trees	2
179	180	0.74	0.12	Pathalayagama, Tissapura	Hambantota	1,1	369	2.59	Private	Near Banana plantation	Other trees	2
180	181	0.67	0.05	Pathalayagama	Hambantota	1,1	369	2.34	Government	Scrubland	Other trees	7
181	182	0.81	0.41	Gonnoruwa	Hamba	1,1	369	2.83	Govern	Scrubland	Other	4

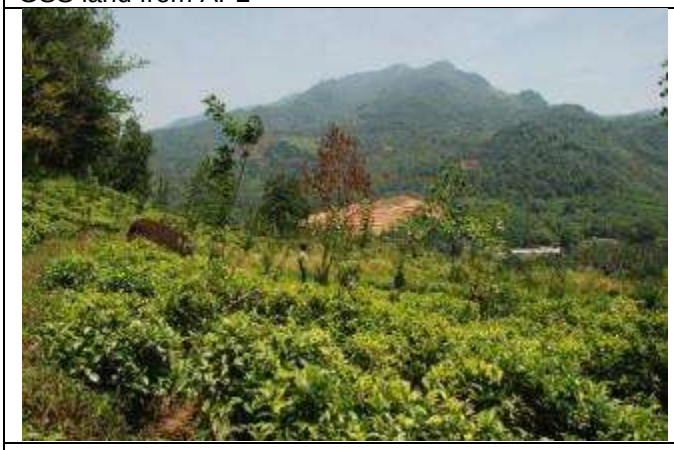
Angle point No From	Angle point No To	Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m2	Area under the ROW (35 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
					ntota				ment		trees	
182	183	0.39	0.16	Gonnoruwa	Hambantota	2,0	450	1.36	Government	Scrubland	No trees	0
											Total	5389

PHOTOGRAPHS

T-1. - New Polpitiya-Hambantota 220 kV Transmission Development

Polpitiya- Hambantota 220 kV transmission line project- Angle points and the habitats along the RoW

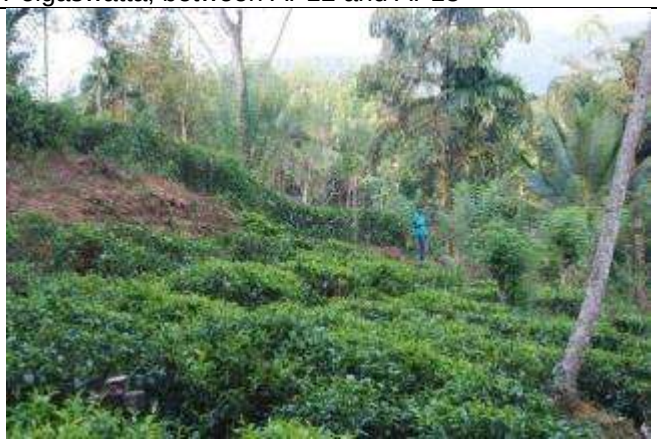
New Polpitiya GSS under construction (20.03.2016)

	
	GSS land from AP2
	
GSS land from AP2	AP 2 in a tea small holding, Polpitiya
	
AP2	AP3 behind a house, Polpitiya

	
AP3	AP4 in tea small holding, Polpitiya, a house is on the right, just outside the RoW
	
AP4	AP5 in a tea small holding, Polpitiya
	
Towards AP6	AP6 in a tea small holding, Kohowilakanda, Paratalawa

	
AP 6	Towards AP 5 (from AP6)
	
Towards AP 7 (from AP6)	AP 7 in a edge of the tea garden, Paratalawa
	
AP7	House near AP7

	
AP8 is 70 m from this point, Pitakanda	AP 8
	
AP 9, 50 m from the road, Pitakanda	AP 10 in a tea small holding, Polgaswatte
	
AP 10	AP 11 in a edge of a tea garden, Polgaswatte

	
AP 11	AP12 is in the small hill with few coconut trees, in the background
	
AP 12 is in the hill with coconut trees	Transmission line crossing the gravel road, Polgaswatta, between AP12 and AP13
	
AP 13 in a tea small holding, Polgaswatte	AP13 in a tea small holding, Polgaswatte

Hambantota GSS

	
Existing Hambantota GSS	Existing Hambantota GSS
Hambantota GSS	

T-4. - Padukka – Horana 132 kV Transmission Development

Angle point No from	Angle point No to	Distance between two towers/ angle points/km	Approximate distance of transmission line from nearby Village/ km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m^2	Area under the ROW (30 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
1	2	0.01	0.21	Walpita, Batawala	Colombo	1/0	225	0.3	Government	Cleared area for GSS.(near to Batawala purana viharaya)	No trees	
2	3	0.44	0.02	Nawalamulla	Colombo	1/0	225	1.32	Private	Paddy fields	No trees	
3	4	0.61	0.04	Nawalamulla	Colombo	1/1	369	1.83	Private	Paddy fields (line near to Sri Sammatharamaya temple)	No trees	
4	5	0.4	0.04	Meegodadeniya	Colombo	1/0	225	1.2	Private	Paddy & rubber areas (point 5 located in a rubber plantation)	Rubber	60
											Coconut	1
											Aricanut	7
5	6	0.26	0.03	Meegodadeniya	Colombo	1/0	225	0.78	Private	Paddy & Young Coconut plantation (cross 33 kV line)	Rubber	50
											Pulun	1
											Kenda	2
											Young Coconut trees	12
6	7	0.32	0.08	Meegodadeniya	Colombo	1/0	225	0.96	Private	Home gardens	Jak	4
											Aricanut	32
											Coconut	12
7	8	0.41	0.04	Sri Rathana Mawatha	Colombo	1/0	225	1.23	Private	Home gardens	Rubber	90
											Alstonia	1
											Coconut	3
											Aricanut	2
											Gorok	2
											Kithul	1
											Pulun	2
											Jak	1
8	9	0.25	0.05	Panaluwa	Colombo	1/0	225	0.75	Private	Paddy fields	No trees	
9	10	0.51	0.07	Panaluwa	Colombo	1/0	225	1.53	Private	Paddy fields	No trees	
10	11	0.29	0.09	Meegoda	Colombo	1/0	225	0.87		Paddy fields	Aricanut	10
											Kottamba	2
11	12	0.69	0.04	Gammana para, Meegoda	Colombo	1/1	369	2.07	Private	Paddy fields (line cross High-level road)	Kottamba	2
											Acacia	1
											Kenda	2
12	13	0.71	0.06	Galabedihena	Colombo	1/1	369	2.13	Private	Paddy fields (line cross 33 kV line)	Kottamba	4
13	14	0.22	0.1	Meegoda	Colombo	1/0	225	0.66	Private	Paddy fields (line cross 33 kV line)	No trees	
14	15	0.25	0.1	Koshena	Colombo	1/0	225	0.75	Private	Paddy fields, Home gardens edge (line cross 33 kV line)	Aricanut	14
											Kottan	1
											Pulun	2
15	16	0.23	0.03	Koshena	Colombo	1/0	225	0.69	Private	Paddy fields, Home gardens edge ,Coconut plantation(line cross two 33 kV lines, cross rail road and Padukka-Godagama road)	Coconut	33
											Rambutan	1
											Aricanut	26
											Jak	1
											Kottamba	1
16	17	0.32	0.04	Koshena	Colombo	1/0	225	0.96	Private	Coconut plantation & Paddy fields (Point 16 located in a Coconut plantation)	Coconut	158

Angle point No from	Angle point No to	Distance between two towers/ angle points/km	Approximate distance of transmission line from nearby Village/ km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m^2	Area under the ROW (30 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
17	18	0.26	0.02	Watareka	Colombo	1/0	225	0.78	Private	Paddy fields, Home gardens(line cross rail road, Padukka-Godagama road)	Aricanut	20
											Kithul	3
											Domba	1
											Young Coconut trees	24
18	19	1.36	0.08	Thuthtiripitiya	Colombo	1/2	513	4.08	Private	Paddy fields(cross two 33 kV lines)	No trees	
19	20	0.08	0.02	Halkandawatta,Liyanwala	Colombo	1/0	225	0.24	Private	Paddy fields	No trees	
20	21	0.29	0.03	Liyanwala	Colombo	1/0	225	0.87	Private	Paddy fields	No trees	
21	22	0.3	0.05	Liyanwala	Colombo	1/0	225	0.9	Private	Paddy fields, Home gardens(near a plant nursery, near Liyanwala Ananda Samarakoon KV,Holy family church)	Bamboo	4
											Pulun	3
22	23	0.24	0.16	Kumara Mawatha,Pahala Padukka	Colombo	1/0	225	0.72	Private	Paddy fields, Home gardens	Mahogany	1
											Bamboo	1
											Rubber	2
23	24	0.54	0.08	Padukka	Colombo	1/1	369	1.62	Private	Paddy fields(cross Padukka road-B240,cross railroad)	No trees	
24	25	0.49	0.15	Polwatta,Padukka	Colombo	1/0	225	1.47	Private	Paddy fields	Kithul	1
25	26	0.59	0.08	Padukka	Colombo	1/1	369	1.77	Private	Paddy fields	No trees	
26	27	0.22	0.09	Padukka	Colombo	1/0	225	0.66	Private	Paddy fields, Home gardens(line cross 33 kV line,Horana-Padukka road)	Bamboo	2
											Young Coconut trees	3
27	28	0.26	0.09	Pore gedara	Colombo	1/0	225	0.78	Private	Paddy fields	Aricanut	1
28	29	0.69	0.12	Pore gedara	Colombo	1/1	369	2.07	Private	Paddy fields	Aricanut	8
											Kottamba	1
											Bamboo	1
29	30	0.59	0.18	Pore gedara	Colombo	1/1	369	1.77	Private	Paddy fields	No trees	
30	31	0.77	0.23	Kotigamgoda	Colombo	1/1	369	2.31	Private	Paddy fields	Bamboo	1
											Pulun	1
											Aricanut	5
31	32	0.88	0.13	Maguruwila	Kalutara	1/1	369	2.64	Private	Paddy fields	No trees	
32	33	0.63	0.17	Malagala	Kalutara	1/1	369	1.89	Private	Paddy fields	No trees	
33	34	0.34		Koralaima,Malagala	Kalutara	1/0	225	1.02	Private	Paddy fields, Rubber plantation	Coconut	10
											Teak	1
											Young Rubber trees	190

Angle point No from	Angle point No to	Distance between two towers/ angle points/km	Approximate distance of transmission line from nearby Village/ km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m^2	Area under the ROW (30 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
34	35	0.38	0.09	Malagala	Kalutara	1/0	225	1.14	Private	Paddy fields, Rubber plantation	Young Rubber trees	110
35	36	0.39	0.05	Malagala	Kalutara	1/0	225	1.17	Private	Paddy fields	No trees	
36	37	0.47	0.05	Malagala	Kalutara	1/0	225	1.41	Private	Paddy fields(cross Malagala road,cross 33 kV lines, line near Malagala MV,Malagala)	Coconut	9
											Mango	1
											Aricanut	10
37	38	0.28		Malagala	Kalutara	1/0	225	0.84	Private	Paddy fields	Rubber	4
38	39	1.06	0.07	Yatawatura, Kahawala	Kalutara	1/2	513	3.18	Private	Paddy fields	No trees	
39	40	1.38	0.1	Panangala	Kalutara	1/3	657	4.14	Private	Paddy fields	No trees	
40	41	0.2	0.14	Panangala	Kalutara	1/0	225	0.6	Private	Paddy fields, Home gardens	Kanda	1
											Jak	1
											Rukattana	2
41	42	0.34	0.05	Pahurugala	Kalutara	1/ 0	225	1.02	Private	Paddy fields, Home gardens(line near to a house & small rural industry)	Teak	3
											Mahogany	4
											Alstonia	1
42	43	0.38	0.15	Pahurugala	Kalutara	1/0	225	1.14	Private	Paddy fields	No trees	
43	44	0.22		Pahurugala	Kalutara	1/0	225	0.66	Private	Paddy fields, Home gardens	Coconut	1
44	45	0.14	0.15	Maputugala	Kalutara	1/0	225	0.42	Private	Home gardens	Alstonia	10
											Coconut	10
											Aricanut	4
45	46	0.30	0.06	Maputugala	Kalutara	1/0	225	0.9	Private	Home gardens	Alstonia	3
											Jak	2
46	47	0.40		Maputugala	Kalutara	1/0	225	1.2	Private	Paddy fields, Home gardens	Rambutan	2
											Rubber	30
											Nadun	1
											Bamboo	1
											Mahogany	2
47	48	0.24	0.04	Diklanda	Kalutara	1/0	225	0.72	Private	Paddy fields	Aricanut	1
											Coconut	1
48	49	0.28	0.05	Diklanda	Kalutara	1/0	225	0.84	Private	Paddy fields, Home gardens	Aricanut	6
											Kottamba	4
49	50	0.31	0.05	Diklanda	Kalutara	1/ 0	225	0.93	Private	Paddy fields	Coconut	1
											Alstonia	1
											Ruk	1
50	51	0.51	0.04	Alubohena	Kalutara	1/0	225	1.53	Private	Paddy fields(cross 33 kV lines)	Coconut	3
											Rubber	1

Angle point No from	Angle point No to	Distance between two towers/ angle points/km	Approximate distance of transmission line from nearby Village/ km	Name of Villages	Name of District	Nos. of towers Angle/Suspension	Area of towers/m^2	Area under the ROW (30 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
51	52	0.43		Alubohena	Kalutara	1/0	225	1.29	Private	Paddy fields	Bamboo	1
											Aricanut	1
52	53	0.12	0.02	Madamukalana,Poruwadanda	Kalutara	1/0	225	0.36	Private	Paddy fields, Home gardens(cross A8 road,33 kV line)	Coconut	1
											Aricanut	4
53	54	0.43	0.05	Poruwadanda	Kalutara	1/0	225	1.29	Private	Paddy fields	Katupol	12
											Kubuk	1
54	55	0.26	0.12	Kakulaliya,Galwatigodella	Kalutara	1/0	225	0.78	Private	Paddy fields	Kubuk	1
55	56	0.47	0.04	Galwatigodella	Kalutara	1/0	225	1.41	Private	Paddy fields	No trees	
56	GSS	0.2	0.04	Galwatigodella	Kalutara	2/0	450	0.6	Private	Rubber plantation	Rubber	195
											Total trees	1114

PHOTOGRAPHS

T-4. - Padukka – Horana 132 kV Transmission Development

New Padukka GSS under construction

New Padukka GSS under construction

	
New Padukka GSS under construction	New Padukka GSS under construction
	
New Padukka GSS under construction	GSS land seen from the paddy field
	
GSS land seen from the paddy field	Horana GSS

	
Horana GSS	Horana GSS
	
Horana GSS	Horana GSS
	
Line through paddy fields	

	
	
	
Line crosses A4 Colombo- Ratnapura road	

	
Line crosses railway tract	Through coconut plantation
	
	
Through home gardens	

	
Line pass through rubber plantation before reaching Horana GSS	

T-7. - Second Circuit Stringing of Habarana - Valachchenai132 kV Transmission Line

	
Valachcenai GSS	
	

	
	A house underneath the line
	
	Young coconut trees underneath the line
	

	
Through Paddy fields	
	
	Through scrublands
	
Parallel to the railway line	

	
Through scrublands	Line is behind Punani Railway station
	
Angle tower near Punani station	
	
Line crossing the Batticaloa road	

	
	Paddy fileds
	
	Line crossing Polonnaruwa- Sungawila road
	
	Line crossing Polonnaruwa- Hingurakgoda road

	
	Second circuit conductors would be very close to the rice factory
	
Coloured tower at Hingurakgoda area	
	
Line through paddy fields, Hingurakgoda	Line crossing Hingurakgoda- Minneriya road

	
Line crossing Habarana- Polonnaruwa road	Line crossing Habarana- Polonnaruwa road
	
	
Line at Irigeoya area	Habarana GSS

	
	 CEYLON ELECTRICITY BOARD GRID SUBSTATION HARARAMA

Annexure 5 Environment Management Plan (EMP)

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Pre-construction						
Temporary use of lands	Impact to the existing environment	Selection of lands adhering to local laws and regulations and in close consultation with LAs Construction facilities should be placed at least 100 m away from water bodies, natural flow paths, important ecological habitats and residential areas	Water and air quality	Air quality Standards and CEA water quality standards	CEB Contractor	Detailed design
Substation location and design	Noise generation Exposure to noise, Nuisance to neighbouring properties	Substation designed to ensure noise will not be a nuisance.	Expected noise emissions based on substation design, noise levels	Noise control regulations in 1994 Noise levels to be specified in tender documents	CEB	Detailed design
	Disturbance to the adjacent lands and the people due to cut and fill operations	Maintain adequate clearance, construction of retaining structures, minimise cut and fill operations adjoining to the dwellings	Proximity to houses and other structures	Setback distances to nearest houses – as per RoW norm of 35 m	CEB	Detailed design
Location of transmission towers and transmission line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Tower location and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses – as per RoW norm of 35 m	CEB	Part of tower sighting survey and detailed alignment survey and design
	Impact on water bodies / land/ residences	Consideration of site location at where they could be located to avoid water bodies or agricultural land as much as possible.	Site location away from water bodies, line alignment selection (distance	Consultation with local authorities and land owners,	CEB	Part of detailed project sighting and survey and design

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		Careful site selection to avoid existing settlements	to dwelling, water and/or agricultural land)	CEA water quality standards		
Equipment specifications and design parameters	Release of chemicals and harmful gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment. Battery, transformer oils, SF_6 stored at substation sites with appropriate care.	Compliance with National Environmental (Amendment) Act, of Sri Lanka	Banned under schedule VIII of NEA Act	CEB	Detailed design
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	Avoid encroachment by careful site and alignment selection Minimise the need by using existing towers and RoW wherever possible	Floral and faunal habitats loss	Flora and fauna protection act.	CEB	Detailed design
Involuntary resettlement or land acquisition	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land as per GoSL procedures	Public complaints	Rates stipulated in the Resettlement plan/Frame work for the project	CEB	Prior to construction phase
Encroachment into farmland	Loss of agricultural productivity	Use existing tower footings/towers wherever possible Avoid sighting new towers on farmland wherever possible. Farmers compensated for any temporary/permanent loss of productive land trees that need to be trimmed removed along RoW.	Tower location and line alignment selection Design/Implementation of crop and tree compensation (based on affected area) Statutory approvals for tree trimming /removal	Agrarian Service Act. Consultation with local authorities and design engineers	CEB	Part of detailed alignment survey and design
Interference	Temporally flooding	Appropriate sighting of towers to	Site location and	Irrigation Act	CEB	Detailed

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
with drainage patterns/Irrigation channels	hazards/loss of agricultural production	avoid channel interference	line alignment selection	1933. Consultation with local authorities and design engineers		alignment survey and design
Explosions/Fire	Hazards to life	Design of substations to include modern fire control systems/firewalls. Provision of firefighting equipment to be located close to transformers, power generation equipment.	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications	CEB	Part of detailed substation layout and design /drawings
Construction						
Removal or disturbance to other public utilities	Public inconvenient	Advance notice to the public about the time and the duration of the utility disruption Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities Restore the utilities immediately to overcome public inconvenient	Disruption of other commercial and public activities / Public complaints	Technical specification	CEB/ contractor	Throughout the construction period
Acquisition of paddy fields and other lands	Loss of agricultural productivity	Avoid farming season wherever possible for the project activities. Ensure existing irrigation facilities are maintained in working condition Protect /preserve topsoil and reinstate after construction completed	Land area of agriculture loss Usage of existing utilities Status of facilities (earthwork in m^3)	Agrarian Service Act. Regular monitoring compliance with regulations	CEB, Contractor through contract provisions	Throughout the construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		Repair /reinstate damaged bunds etc. after construction completed Compensation for temporary loss in agricultural production	Implementation of Crop compensation (amount paid, dates, etc.)			
Temporary outage of the electricity	Loss of power supply to the local community when distribution lines crossing the new transmission line are switched off	Advance notice to the public about the time and the duration of the utility disruption Restore the utilities immediately to overcome public inconvenient.	Houses and commercial premises of power disruption	Regular monitoring during the period of strengthening the conductors	Contractor CEB	Throughout the construction period
Equipment layout and installation	Noise and vibrations	Selection of construction techniques and machinery to minimise ground disturbance.	Construction techniques and machinery	Minimal ground disturbance	CEB, Contractor through contract provisions	Construction period
Substation construction	Loss of soil	Fill for the substation foundations obtained by creating or improving local drain system.	Borrow area sighting (area of site in m^2 and estimated volume in m^3)	Laws and regulations of respective LAs	CEB, Contractor through contract provisions	Construction period
	Water pollution	Construction activities involving significant ground disturbance (i.e. substation land forming) not undertaken during the monsoon season.	Seasonal start and finish of major earthworks (pH, BOD/COD, Suspended solids, other)	Timing of major disturbance activities - prior to start of construction activities	CEB, Contractor through contract provisions	Construction period
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise level, [dB(a)])	Daytime construction only	CEB, Contractor through contract	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
					provisions	
	Nuisance to elephants if the line construction crosses their migratory path	Restrict construction work during the known period of migration by the elephants	Timing of Construction	Construction with due care during the period of migration of elephants	CEB, Contractor	Construction period
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities	CEB, Contractor through contract provisions	Construction period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Any excess material will only be used as fill material offsite when the owner's agreement has been obtained and with the disposal site restored in a manner that prevents erosion and does not block any drainage path	Location and amount (m^3)of fill disposal Soil disposal locations and volume (m^3)	Appropriate fill disposal and dispersal locations	CEB, Contractor through contract provisions	Construction period
Air Pollution	Loose dust might blow in the area causing dusty conditions	Damping of dust by sprinkling of water within the work area and stack the loose soil and contain it with covers if required.	Soil stacking locations, access roads, tower locations, substation site	Air Quality Standards	CEB, Contractor through contract provisions	Construction period
Wood/ vegetation harvesting, cut and fill operations	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment.	Illegal wood /vegetation harvesting (area in m^2, number of incidents reported)	Complaints by local people or other evidence of illegal harvesting	CEB, Contractor through contract provisions	Construction period
	Effect on fauna	Prevent his work force from disturbing to the flora, fauna	Habitat loss	Fauna and flora protection	CEB/ DWC/ DoF	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		including hunting of animal and fishing in water bodies Proper awareness programme regarding conservation of flora, fauna including ground vegetation to all drivers, operators and other workers		Act.		
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m^2)	Felling of trees (Amendment Act. Nº 01 of 2000 and act of felling of trees control) Clearance strictly limited to target vegetation	CEB, Contractor through contract provisions	Construction period
	Soil erosion and surface runoff	Construction in erosion and flood-prone areas should be restricted to the dry season Treat clearing and filling areas against flow acceleration and construction work should be carefully designed to minimise obstruction or destruction to natural drainage	Soil erosion	Visual inspection (Turbidity and sedimentation)	CEB, Contractor through contract provisions	Construction period
Mechanised construction	Noise, vibration and operator safety, efficient operation Noise, vibration, equipment wear and	Construction equipment to be well maintained. Proper maintenance and turning off plant not in use.	Construction equipment - estimated noise level and operating schedules	Technical specifications, safety regulations, Noise control regulations in	CEB, Contractor through contract provisions	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
	tear			1994		
Construction of roads for accessibility	Increase in airborne dust particles Increased land requirement for temporary accessibility	Existing roads and tracks used for construction and maintenance access to the site wherever possible. New access ways restricted to a single carriageway width within the RoW.	Access roads, routes (length and width of new access roads to be constructed)	Use of established roads wherever possible Access restricted to single carriageway width within RoW	CEB, Contractor through contract provisions	Construction period
Transportation and storage of materials	Nascence to the general public	Transport loading and unloading of construction materials should not to cause nuisance to the people by way of noise, vibration and dust. Avoid storage of construction materials beside the road, around water bodies, residential or public sensitive locations Construction materials should be stored in covered areas to ensure protection from dust, emissions and such materials should be bundled in environment friendly and nuisance free manner	Water and air quality	National Environment Act Laws and regulations of respective LAs National Emission Standards and CEA water quality standards	CEB/ CEA/LAs	Construction period
Trimming/cutting of trees within RoW	Fire hazards Loss of vegetation and deforestation	Trees allowed growing up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations.	Species-specific tree retention as approved by statutory authorities	Felling of trees (Amendment Act. No 01, of 2000 and act of felling of trees	CEB, Contractor through contract provisions	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		Trees that can survive pruning to comply should be pruned instead of cleared. Felled trees and other cleared or pruned vegetation to be disposed of as authorised by the statutory bodies.	(average and maximum tree height at maturity, in metres) Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m^2)	control) Presence of target species in RoW following vegetation clearance.		
Health and safety	Injury and sickness of workers and members of the public	Contract provisions specifying minimum setback requirements for construction camps from water bodies, reserved areas etc. Contractor to prepare and implement a health and safety plan. Contractor to arrange for health and safety awareness programmes	Contract clauses (number of incidents and total lost-work days caused by injuries and sickness)	National Health and safety regulations World Bank EHS Guidelines for Electric Power Transmission and Distribution	CEB (Contractor through contract provisions)	Construction period
Nuisance to nearby properties	Losses to neighbouring land uses/values	Contract clauses specifying careful construction practices. As much as possible existing access ways will be used. Productive land will be reinstated following completion of construction Compensation will be paid for loss of production, if any.	Contract clauses Design basis and layout Reinstatement of land status (area affected, m^2) Implementation of Tree/Crop compensation (amount paid)	Incorporating good construction management, design engineering practices Consultation with affected parties immediately	CEB (Contractor through contract provisions)	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
				after completion of construction and after the first harvest		
Operation and Maintenance Phase						
Electric shock	Death or injury to the workers and public	Security fences around substation Establishment of warning signs Careful design using appropriate technologies to minimise hazards	Proper maintenance of fences and sign boards Usage of appropriate technologies (lost work days due to illness and injuries)	Periodic maintenance Number of programmes and percent of staff /workers covered	CEB	Throughout the operation
Noise generation	Nuisance to the community around the site	Provision of noise barriers	Noise level	Noise level (db)- Once a year	CEB	Throughout the operation
Maintenance of Transmission line	Exposure to electromagnetic interference	Transmission line design to comply with the limits of electromagnetic interference from overhead power lines	Required ground clearance (metres)	Ground clearance -	CEB	Throughout the operation
Substation maintenance	Exposure to electromagnetic interference	Substation design to comply with the limits of electromagnetic interference within floor area	Required vibrations level, instrumentation	Technical specifications	CEB	Throughout the operation
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious bundled areas with a storage capacity of at least 110% of the capacity of oil in transformers and associated reserve tanks.	Substation bounding ("as-built" diagrams)	National Environment Act, Bounding capacity and permeability	CEB	Throughout the operation

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
SF6 management	Emission of most potent GHG causing climate Change	Reduction of SF6 emission through awareness, replacement of old seals. Proper handling and storage by controlled inventory and use enhance recovery and applying new technologies to reduce leakage.	(i) regular monitoring of SF6 through pressure gauges; (ii) use of handheld leak detectors to monitor leaks; (iii) prepare annual inventory checklist of SF6 consumption, purchase, and losses to track emissions, and (iv) provide training to staff on proper handling of SF6.	Continuous monitoring	CEB	Throughout the operation

Annexure 6 Environmental Parameters and Periodicity for Environmental Monitoring Plan

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (LKR)	Implementation	Supervision
1. Air Quality	A. Pre-construction stage (The project after assign to contractor)	CO, Pb, PM10, TSPM	Inside and outside (0.5 km) of the proposed substation	A single time – more than one sample from neighbouring area outside substation	NAAQS of Sri Lanka	Per sample LKR 9,000	Contractor by engaging approved monitoring agency (Sri Lankan Government)	Contractor /CEB/CEA
	B. Construction Stage	CO, Pb, PM10, TSPM	Inside and outside (0.5 km) of the proposed substation	1 time in 3 months – more than one sample from neighbouring area outside substation	NAAQS of Sri Lanka	Per sample LKR 9,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA
	C. Operation Stage	CO, Pb, PM10, TSPM	Inside and outside (0.5 km) of the proposed substation	A single time – more than one sample from neighbouring area outside	NAAQS of Sri Lanka	Per sample LKR 9,000	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (LKR)	Implementation	Supervision
				substation				
2. Water Quality	A. Pre-construction stage (The project after assign to contractor)	EC, TSS, DO, BOD, P^H Oil and grease, Pb, E	Surface water body and nearest well (1 sample each) around the substation	A single time	CEA Water Quality Regulations	Per sample LKR 14,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA
	B. Construction Stage	EC, TSS, DO, BOD, P^H Oil and grease, Pb, E	Surface water body and nearest well (1 sample each) around the substation	1 time in 3 months	CEA Water Quality Regulations	Per sample LKR 14,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA
	C. Operation Stage	EC, TSS, DO, BOD, P^H Oil and grease, Pb, E	Surface water body and nearest well (1 sample each) around the substation	1 time in year	CEA Water Quality Regulations	Per sample LKR 14,000	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA
3. Noise/ Vibration	A. Pre-construction stage (The project after assign to contractor)	Noise level (dB level)	Inside and outside (0.5 km) of the proposed substation	A single time – more than one sample from neighbouring area outside	National Environmental (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (LKR)	Implementation	Supervision
				substation				
	B. Construction Stage	Noise level (dB level)	Inside and outside (0.5 km) of the proposed substation	2 times year - – more than one sample from neighbouring area outside substation	National Environmental (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA
	C. Operation Stage	Noise level (dB level)	Inside and outside (0.5 km) of the proposed substation	3 times year- – more than one sample from neighbouring area outside substation	National Environmental (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA
4. Soil	A. Pre-construction stage (The project after assign to contractor)	P^{H}, Sulfate (SO_3), Chloride, ORP, Salinity, Resistively, Organic Matter,	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	A single time	Technical specifications	Per sample LKR 13,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (LKR)	Implementation	Supervision
		Moisture Content						
	B. Construction Stage	P^H, Sulfate (SO_3), Chloride, ORP, Salinity, Resistively, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	Two times	Technical specifications	Per sample LKR 13,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor /CEB/CEA
	C. Operation Stage	P^H, Sulfate (SO_3), Chloride, ORP, Salinity, Resistively, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	A single time	Technical specifications	Per sample LKR 13,500	CEB by engaging approved monitoring agency (Sri Lankan Government)	CEB/CEA
5. SF6	Operation Stage	Volumetric loss from GIS equipment	GIS equipment, circuit breakers	Online monitoring by data loggers	As per Approved Specifications of Equipment	Nil	Instrumentation of the supplier	O&M staff

Abbreviations:

SO_{2-} -Sulphur Dioxide
NO_{2-} - Nitrogen Dioxide
CO- Carbon Monoxide
Pb- Lead
PM10- Particulate Matter <10
TSPM- Total suspended Particulate

Matter

EC- Electrical Conductivity
BOD- Biological Oxygen Demand
NWQS- National Water Quality Standards
DO- Dissolved Oxygen
NAAQS- National Air Quality Standards
CEB- Ceylon Electricity Board
TSS- Total Suspended Solis
CEA- Central Environmental Authority

Notes: Transport and Accommodation cost, NBT, VAT etc are not included for the EMoP. Rates valid for the period of 60 days. Information based on the quotation provided by NBRO (National Building Research Organisation).

Environmental Safeguard Monitoring Report

Reporting Period {From Month, Year to Month, Year}
Date {Month, Year}

SRI: Green Power Development and Energy Efficiency Improvement Investment Program-Tranche 2

Prepared by the Ceylon Electricity Board for the Asian Development Bank

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Annexure 8 Granting of Necessary Wayleaves for Electricity Networks in Sri Lanka - Guidelines for Licensees, Divisional Secretaries and Landowners and/or Occupiers

(A DOCUMENT OF THE PUBLIC UTILITIES COMMISSION OF SRI LANKA dated 27th August 2009)

INTRODUCTION

- The enactment of the Sri Lanka Electricity Act Nº 20 of 2009 (SLEA) has vested powers with the Public Utilities Commission of Sri Lanka (the Commission) to regulate the electricity industry of Sri Lanka.
- Acting on the powers derived, PUCSL has granted licenses to the Ceylon Electricity Board (CEB) and Lanka Electricity Company (Pvt) Ltd (LECO). Accordingly, it has become their statutory duty to develop, maintain and operate efficient and economical systems for transmission and distribution of electricity.
- Transmission networks are owned and operated by the CEB, whereas the distribution systems are owned and operated by CEB and LECO.
- With more than 80% of the population having access to electricity in Sri Lanka, electricity transmission and distribution systems have been made available in almost all areas where there is human habitat. In the process, electric lines and associated equipment are (such as poles, conductors, reclosers, sectionalisers, various types of switches, metering equipment, staywires, transformers, etc.) installed over or under private lands.
- GoSL target is to provide electricity to all by 2015 and with the economic development taking place, demand for electricity is growing at a steady pace. This will necessitate the licensees to use more and more private lands in future as well, to install their networks.
- The licensees need to have access to these lands for the purposes of erecting, inspecting, maintaining, repairing, adjusting, altering, replacing or removing the lines or other equipment.
- In these Guidelines, 'wayleave' in relation to a land means such interest in the land as consists of a right of a licensee, to install and keep installed, an electric line: on, under, or over that land; and to have access to that land for the purposes of inspecting, maintaining, adjusting, repairing, altering, removing or replacing such electric line.
- This document is intended to provide general guidance to:

a) electricity licensees (CEB/LECO) who will be the applicants for the grant of wayleave;
b) the land owners/occupiers whose land is or may be the subject of such application; and
c) Divisional Secretaries (who are empowered to act as representatives of the Commission)

- In terms of Section 3(5) of Schedule I of SLEA, the Commission is empowered to appoint a person to act on behalf of the Commission to carry out specified functions relating to the grant of wayleave clearances.
- Accordingly, in terms of the Gazette Extraordinary Nº 1604/6 dated 1st June 2009, the Divisional Secretaries are appointed as representatives of the Commission, hereinafter referred to as "the Person Appointed by the Commission". Pursuant to the appointment as representatives of the Commission, the Divisional Secretaries are mandated to:

a) Look in to issues/objections of the relevant clearing of way-leaves and installation of electrical lines on lands owned by private parties by giving such parties fair hearing on behalf of the Commission and make recommendations to the Commission; and
b) Receive and acknowledge such issues/objections on the above from the relevant parties in writing on behalf of the Commission and to take appropriate actions as per above.

PROCEDURES TO BE FOLLOWED UNDER SLEA

- The Sections 3 to 7 of Schedule I of the SLEA govern the wayleave clearances whereas the Sections 7 to 10 of Schedule II govern the entry into premises.
- There are two possible scenarios relevant to the grant of a wayleave: for the installation of a new electric line/apparatus; or when there is a request by a landowner/occupier to remove an existing line/apparatus. The Person Appointed by the Commission would also have to consider the matters referred to it in relation to the removal of trees which are/may obstruct, interfere or cause a danger to an electric line or plant.

1. Entry into Any Land or Premises

- Where a licensee wishes to enter a land or premises for the purpose of installing an electric line/plant, minimum of three (3) days notice (specimen notice: appendix 1) stating the nature and extent of the work intended to be carried out, has to be given to the occupier if the land is occupied and to the owner if it is not occupied.
- In cases where the land is not occupied and the name and the address of the owner cannot be ascertained, the notice referred to above should be exhibited at a conspicuous position of the land.
- If the land/premises is used/reserved for a public purpose, then the notice has to be given to the officer or any other person in charge of that land/premises.
- Licensee shall issue written authorisation to the person who is exercising the powers to enter the land/premises.
- If by way of entering the land/premises, if any damage is caused to the land or to any movable or immovable property or caused any disturbance to any person, then he/she may claim compensation from the licensees. The Commission will determine the extent of compensation to be paid.
- Where the efforts made by a licensee to enter any premises under the powers conferred to it by the SLEA were unsuccessful, the permission should be sought by applying to the Magistrate's Courts having jurisdiction over the place and its decision shall be final.

2. Obtaining a Wayleave for a New Electricity Line/Plant

- All efforts should be made by the licensee who requires the wayleave, to enter into an agreement with the landowner/occupier to obtain such wayleave. The terms and conditions of the agreement shall include, among others, the period for which the wayleave is granted
- (if it is not permanent) and the compensation to be paid by the licensee for the disturbances
- and/or damages caused by the installation of the new line/plant.
- Where the licensee is unable to reach an agreement with the landowner/occupier in relation to obtaining the wayleave, it shall give the landowner/occupier a minimum of twenty one (21) days notice (specimen notice: appendix 4) requiring the grant of wayleave.
- If the landowner/occupier fails to grant the wayleave within the period specified in the notice or grants the wayleave subject to the terms and conditions which are not acceptable to the licensee, within seven (7) days from the expiry of the period specified in the notice, the licensee may make an application to the Person Appointed by the Commission requiring the grant of the wayleave. (particulars to be submitted along with an application to grant of wayleave.
- In the application, it is necessary for the licensee to prove that the acquisition of the wayleave is necessary to carry out its licensed activities and most importantly that it has taken

all possible measures to reach an agreement, but have been unsuccessful.

- The application shall not be considered, if the proposed line is to be installed over a land which is covered by an authorised dwelling or permission has been granted to construct a dwelling.
- On the receipt of a successful application, the Person Appointed by the Commission will hold an inquiry, to provide an opportunity for the occupier or the land owner (where the occupier is not the owner) to be heard, and forward his/her recommendations to the Commission relating to the application within fourteen (14) days of the receipt of such application.
- Within six (6) weeks of the application, considering the recommendation of the Person Appointed by the Commission:

a) the Commission may either authorise or prohibit the licensee any of the acts mentioned in the notice (issued to the land owner or occupier) either unconditionally or subject to such terms, conditions and stipulations as it thinks fit; or

b) if the Commission is satisfied that the acquisition of that wayleave is necessary for carrying on of the activities authorised by the license of the licensee, recommend to the Minister to acquire the wayleave under the Land Acquisition Act.

- If the Commission's recommendation to acquire the wayleave is approved, the Minister may by an Order published in the Gazette acquire the wayleave under the Land Acquisition Act and transfer to the licensee. Wayleave acquired through the Land Acquisition Act shall not be subject to any provision of any enactment and shall bind any person who has been the owner/occupier of the land over which wayleave has been granted.
- In addition, the Person Appointed by the Commission will also recommend to the Commission the amounts of compensation payable to the owner or occupier of the land. Licensee is bound to pay compensation, as determined by the Commission, to the owner or occupier of the land. If the owner is unknown or the ownership is subject to dispute, licensee will deposit the sum to be paid as compensation in the district courts and inform the relevant parties accordingly or exhibit that notice at a conspicuous position of the land.
- Any person who is aggrieved by the Commission's determination on the subject of compensation could institute action in a Court of proper jurisdiction against the licensee.

3. When a Request is made by the Owner/Occupier of a Land to Remove an Existing Electricity Line or Plant

- Where an existing wayleave:

a) is determined by the expiration of the period specified in the agreement;

b) is terminated according to a term contained in the wayleave agreement; or

c) ceases to be binding following a change in ownership or occupancy,

d) the landowner/occupier may request for the removal of the electricity line/apparatus by giving three (3) months' notice.

- On receipt of such notice, the licensee is required to comply with the notice and remove the electricity line/apparatus before the end of the specified period. However if it does not want to comply with the request, all efforts should be made by the licensee to enter into a fresh agreement with the landowner/occupier in order to secure such wayleave.
- Where the licensee is unable to reach an agreement with the landowner/occupier in relation to securing the wayleave, an application would have to be forwarded to the Person Appointed by the Commission to secure the wayleave (as explained in previous section), within three (3) months of the notice. (particulars to be submitted along with an application to secure the wayleave
- In the application, it is necessary for the licensee to prove that the wayleave is necessary to carry out its licensed activities and most importantly that it has taken all possible

measures to reach an agreement, but have been unsuccessful.

- On the receipt of a successful application, the Person Appointed by the Commission will hold an inquiry, to provide an opportunity for the occupier or the land owner (where the occupier is not the owner) to be heard, and forward his/her recommendations to the Commission relating to the application within fourteen (14) days of the receipt of such application.
- Within six (6) weeks of the application, considering the recommendation of the Person Appointed by the Commission:

a) the Commission may either authorise or prohibit the licensee to keep installed the electricity line/apparatus specified in the notice issued by the land owner/occupier either unconditionally or subject to such terms, conditions and stipulations as it thinks fit; or

b) if the Commission is satisfied that the acquisition of that wayleave is necessary for carrying on of the activities authorised by the license of the licensee, recommend to the Minister to acquire the wayleave under the Land Acquisition Act.

- If the licensee is prohibited to keep installed the electricity line/apparatus specified in the notice, the licensee will be required to remove the electricity line/apparatus within one (1) month from the date of the Commission's decision or such longer period as the Commission may specify.

4. Removal of Trees which are/may Obstruct, Interfere an Electric Line/Plant or Constitute an Unacceptable Danger to Public (flow diagram showing the procedure: Appendix 8)

- When a tree is in close proximity to an electricity line/plant installed or to be installed and if the licensee is of the opinion that it will obstruct or interfere with the installation, maintenance or working of an electric line/plant or is a source of danger to public, a notice is required to be issued to the occupier of the land with a copy to the owner (where the occupier is not the owner) of the land requiring him/her to fell or lop the tree or cut back its roots, within a period of three (3) days.
- If the occupier complies with the notice, licensee shall pay the reasonable expenses incurred by him/her in complying with the requirements of the notice.
- If within three (3) days of the notice the requirements of the notice are not complied with and neither the owner nor occupier of the land gives a counter-notice, the licensee may cause the tree to be felled or lopped or its roots to be cut back so as to prevent it from obstructing or interfering with the installation, maintenance or working of an electric line/plant or being a source of danger to public. In doing so, the licensee shall:

a) Do it in accordance with good arboricultural practices and so as to do as little damages as possible to trees, fences, hedges and growing crops;

b) Cause the felled trees, lopped boughs or root cuttings to be removed in accordance with the direction of the owner or occupier; and

c) make good any damage caused to the land

- However, if a counter-notice is received objecting to the requirements of the notice within the three (3) days, the matter shall be referred to the Person Appointed by the Commission to hold an inquiry, where all parties will be heard. (particulars to be submitted along with such referral: appendix 9)
- On the receipt of such referral, the Person Appointed by the Commission will hold an inquiry, and forward his/her recommendations to the Commission within fourteen (14) days of the receipt of such referral.
- Upon receipt of the recommendation of the Person Appointed by the Commission, the Commission may make an order:

a) allowing the licensee to cause the tree to be felled or lopped or its roots to be cut back,

after notifying any person by whom a counter notice was given; and

b) determining any question as to what expenses (if any) are to be paid to the licensee by the owner or occupier of the land.