Initial Environmental Examination

March 2016

SRI: Supporting Electricity Supply Reliability Improvement Project

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 8 March 2016)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	$0.00691
$1.00	=	SLRs144.65

ABBREVIATIONS

ADB	–	Asian Development Bank
CEA	–	Central Environment Authority, Government of Sri Lanka
CEB	–	Ceylon Electricity Board
DC or D/C	–	Double Circuit
DPR	–	Detailed Project Report
DSD	–	Divisional Secretarial Divisions
EA	–	Executing Agency
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
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination
LILO	–	Line-in-Line-out
MPRE	–	Ministry of Power and Renewable Energy Government of Sri Lanka
PAA	–	Project Approving Authority
NARA	–	National Aquatic Resources Research & Development Agency
PCB	–	Poly Chlorinated Biphenyl
NEA	–	National Environmental Act
PIU	–	Project Implementing Unit
PMU	–	Project Management Unit
PRDA	–	Provincial Road Development Authority

PUCSL	–	Public Utility Commission of Sri Lanka
REA	–	Rapid Environment Assessment
ROW	–	Right of Way
RP	–	Resettlement Plan
SC or S/C	–	Single Circuit
SF	–	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	–	megawatt

NOTES

In this report, “USD” refers to US dollars.
“SLRs” refers to Sri Lankan rupees

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EXECUTIVE SUMMARY

i. Asian Development Bank (ADB) is proposing to extend USD 118.8 million loan to Sri Lanka's power sector for supporting electricity supply reliability improvement to Ceylon Electricity Board (CEB). The loan will focus on identifying the hybrid renewable energy (wind and solar) mini-grids in Analaitivu, Delft and Nainativu Islands in Jaffna peninsula, medium voltage network in ten administrative districts of the country, rural electrification schemes in sixteen districts, and renewable energy based pilot microgrid for evacuation of renewable energy (solar) projects and overall improvement of network efficiency.

ii. The components of the Supporting Electricity Supply Reliability Improvement Project will consist of four components.

Component 1: Renewable energy development
- 1.1 Hybrid renewable energy systems in small isolated islands
- 1.2 Productive energy use for small isolated islands and rural communities
- 1.3 Renewable energy based microgrid pilot project

Component 2: Reliability improvement of the medium voltage network
Component 3: Rural electrification and distribution performance monitoring
Component 4: Reactive Power Management in the Transmission System

iii. Hybrid renewable energy mini-grid systems have been proposed in three islands, Delft, Nainativu and Analaitivu, all located off the western coast of Jaffna peninsula. Delft Island, the largest of the three, approx 50 km^2, situated about 10 km from mainland, is the second largest island situated within the territorial waters in Sri Lanka. The Delft National Park, 1846.28 ha, declared on 19th June 2015, by the Department of Wildlife Conservation for conservation of wild horses is situated in the southern part of the island and it occupies about 37% of the land area. The land identified for the hybrid system is about 800 m outside the National Park and belongs to the government.

iv. Productive energy use for small isolated islands and rural communities will promote and strengthen energy-based livelihoods through access to electrical appliances and technologies, emerging with the availability of electricity for production and marketing of traditional crafts and other similar local manufacturing activities.

v. Renewable energy based microgrid pilot project will establish and examine its feasibility as an extension to the conventional utility distribution system, (ii) catalyse adoption of distributed generation as a means of improving network efficiency and demand side management and (iii) validate the effectiveness of dc electricity supply as an energy efficiency measure. A microgrid pilot project is proposed under this project by Lanka Electricity Company (Pvt) Ltd. The proposed microgrid pilot project will include 300 kWp of solar PV, 300 kW inverter, 120 kWh battery storage, 400 kVA diesel generator and a microgrid central management system.

vi. The proposed medium voltage (MV) network consists of sixteen 33 kV lines located in all four Distribution Divisions (DD1-DD4) of the CEB. The length of each line is varied from 5 to 34 km and found in all three climatic zones, wet, intermediate and the dry, of Sri Lanka. The proposed MV lines traverse through man-modified habitats such as home gardens, paddy fields, tea plantations, rubber and coconut plantations, teak and mixed-species plantations established

by the Forest Department, some abandoned lands and degraded forest patches adjacent to villages.

vii. The 33 kV lines in all four distribution divisions of CEB traverse mainly through paddy fields, degraded lands, plantations (tea, rubber) and home gardens. Temporary impacts are foreseen on loss of crops during construction and loss of trees (2,128) is also anticipated. The selected 250-300 m^2 plots of land required for gantry based switching stations for Uhana and Bibile will be based on CEB lands, and no acquisition of land will be required from the surrounding communities. CEB will acquire the lands for Keeriyankalliya, Rathmalgoda, Ma-Eliya, Maskeliya, Warukandeniya, Morawaka and Mattaka, from private landowners. Lands for Irakkandy, Kumburupitiya, Wellawaya and Ella gantries will be transferred from the Divisional Secretaries.

viii. Non-availability of the national grid in the faraway villages is one of the major reasons for the low electrification level in certain locations, and the high cost of the grid extensions had been the main barrier to supply electricity to such locations. Under this project, 106 rural electrification (RE) schemes including 198 km of MV lines and 393 km of LV lines are proposed to be implemented.

ix. Reactive power management in the transmission system will include the installation of 100 Mvar breaker-switched capacitors (BSC) at the 132 kV bus bar of the existing Pannipitiya GS (including a new 132 kV BSC bay) to control the voltage of the 220 kV bus bar, and the installation of a +100/-50 Mvar static var compensator (SVC) at the 220 kV bus bar of the existing Biyagama GS (including a new 220 kV SVC bay) to control the voltage of the 220 kV bus bar during dynamic conditions.

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

xii. The proposed project will have a number of positive impacts and negative impacts on 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 in home gardens and plantations (rubber and coconut) for the tower lines 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, coconut and rubber plantations; which

will be compensated based on established rates by CEB (Elcetricity Act 2009).

xiii. The proposed project will improve operational efficiency and quality of power, voltages, reliability of the system and at the same time will reduce losses. Supply of power to both the local areas and regions will boost economic development of the area by strengthening the power distribution infrastructure. Overall, the major social and environmental impacts associated with distribution 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.

xiv. Various mitigation measures to be taken prior to the project activities are listed in the project IEE. Potential adverse environment impacts associated with tower 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 scrublands, cultivated paddy fields, rubber plantations, tea cultivations etc. The lines will also pass through degraded forest areas but avoid any national park or sanctuary. The alignments in this project have also avoided wetlands and geologically unstable areas, which can also pose foundation related problems. Government and private land will be used for all proposed gantry based switching stations but no land will be acquired for placing distribution 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 distribution tower. After construction, agricultural land within the distribution corridors can be used again for farming purpose.

xv. Since the project does not involve activities that have significant adverse impacts, an initial environmental examination (IEE) been done to determine the extent of impact as per the ADB's new Safeguard Policy Statement (SPS) 2009. The environmental classification for the project is "Category B". The IEE report conforms to the Ministry of Mahaweli Development and Environment guidelines and regulations and is consistent with ADB SPS 2009.

I. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. Background

1. The Government of Sri Lanka aims to ensure sustainable development of energy resources by improving the power supply systems to guarantee that the entire population has access to electricity services. Sri Lanka has a national investment program including sector investments that are based on National Energy Policy and Strategies (NEPS, 2008). The National Energy Policy and Strategies of Sri Lanka, published by the Ministry of Power and Renewable Energy by Gazette Extraordinary of the Democratic Socialist Republic of Sri Lanka dated 10.06.2008, details Sri Lanka's Energy Sector Policy. According to the policy, sustainable development of energy resources, conversion facilities and delivery systems to enable access to and use of energy services by the entire population and the safe, reliable delivery of such energy services at a regionally competitive price through commercially viable institutions subjected to independent regulation has been considered as broad policy objectives. The NEPS includes a sector roadmap, a long-term investment program, and appropriate policy and reform measures.

2. The country's installed power generation capacity at end 2014 was approximately 3,932 MW, consisting of 900 MW of coal power, 1,215 MW of oil burning thermal power, 1,377 MW of hydro power and 440 MW of non-conventional renewable energy sources such as wind, mini hydro, biomass and solar power plants (CEB, Statistical Digest 2014).

3. The demand for electricity in Sri Lanka is growing at a rate of about 4-5% per annum. Therefore, the generation capacity, transmission and associated grid substation facilities have to be expanded and strengthened in order to meet the growing demand and provide reliable power supply. The Ministry of Power & Renewable Energy in its Strategic Plan document entitled 'Energy Empowered Nation' issued in the year 2015 identifies among others, to increase the electricity generation capacity of the system from 3,932 MW to 6,400 MW by 2025. CEB completed a Master Plan Study in 2006 for the development of the Transmission system with technical assistance from Japan International Co-operation Agency (JICA). The development proposals identified by this Master Plan are reviewed during generation and transmission planning process to identify the urgent reinforcement requirements of the existing system. Long Term Transmission Development studies are carried out once in two years and the studies are mainly based on the latest available National Load Forecast, Long Term Generation Expansion Plan and Medium Voltage Distribution Development Plans prepared by respective Distribution Divisions (DD1-DD4).

4. In order accomplish above policy objectives, the CEB has to develop and maintain an efficient and coordinated economical system of electricity supply to the country as well as to generate or acquire supplies of electricity. Generation expansion planning is a part of the process of achieving the above objectives. In order to meet the increasing demand for electrical energy and to replace the thermal plants due for retirement, new generating stations need to be installed as and when necessary. Further to the above, CEB has prepared a Long Term Generation Expansion Plan (2015-2034) in 2015 with the following objectives:

- To investigate the feasibility of new generating plants for addition to the system in terms of plant and system characteristics.
- To specifically investigate the future operations of the hydro-thermal system in order to determine the most economical operating policy for reservoirs, hydro and thermal plant.
- To conduct system simulation studies to determine the economically optimum mix of generating plants to meet the forecast demand and the acceptable reliability levels in the 20-year period ahead.
- To investigate the robustness of the economically optimum plan by analyzing its sensitivity to changes in the key input parameters.

5. The power sector has undergone significant policy level and structural changes recently:

- 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 FBUs have been issued licenses by the Public Utilities Commission of Sri Lanka (PUCSL) and they have been filing the tariff petitions since 2010.

6. The Ministry of Power & Renewable Energy (MPRE) manages Sri Lanka's electricity industry. 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: State-owned 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 5 million customers)
Lanka Electricity Company (Pvt) Ltd (LECO)	State-owned company, engaged in power distribution (one license, 500,000 customers) along western and southern coastal regions.

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.
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.

7. 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 GS (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.

8. 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 98% of the geography of Sri Lanka. Lanka Electricity Company Ltd. (LECO), which is a subsidiary of CEB, covers the remaining areas catering to about 500,000 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 11kV/400 V), and LV lines (400 V).

9. ADB is proposing to extend USD 118.8 million loan to Sri Lanka's power sector for supporting electricity supply reliability improvement project. The specific focus of this assistance is for renewable energy development, reliability improvement of the medium voltage network, rural electrification and distribution performance monitoring and reactive power management in the transmission system. The project identified for the ADB financing is focused on hybrid renewable energy systems in the islands of Analaitivu, Delft and Nainativu in Jaffna district, assisting productive use of electricity by the communities of the islands of Analaitivu, Delft and Nainativu, renewable energy based microgrid pilot project, construction of new 33 kV tower lines using bare conductors and associated gantries in ten districts, construction of new 33 kV aerial bundled conductor (ABC) lines, installation of 33 kV auto reclosers and 33 kV load break switches, expansion of the distribution network in rural areas, installation of meters at distribution transformers to monitor performance, and installation of reactive power management devices in Pannipitiya and Biyagama GS.

B. Sope of Work and Methodology Adopted

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

i. 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;
ii. To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed project;
iii. To prepare an environmental management plan for protecting the environment including institutional arrangement and environmental monitoring;
iv. To identify critical environmental attributes required to be monitored subsequent to the implementation of the proposed project;
v. To carry out consultation with local people so as to identify the public perception of the project; and
vi. To establish the Environment Monitoring Plan (EMoP) for the CEB to submit environmental monitoring reports to ADB at regular intervals.

11. This report is prepared based on surveys, field studies and with the help of available secondary data. The alignment of line may slightly vary after the exact demarcation of tower locations. 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 100 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 Google Earth, National Atlas and 1:50,000 land use maps prepared by the Survey Department, Sri Lanka.

12. The IEE report comprises baseline data on existing physical, ecological, economic, and social condition, together with the anticipated environmental impacts and proposed mitigation measures. The project sites for hybrid renewable energy systems in three islands: Analaitivu, Delft and Nainativu, all located off the western coast of Jaffna peninsula, were selected after field surveys conducted from 5th to 8th Nov. 2015 and 8th to 10th January 2016. Observations were made through transect walk along the tower line locations, rural electrification schemes as well as in and around the proposed premises for new gantries from 17th December 2015 to 14th January 2016. Public consultations were held with the project affected communities, stakeholders, and government officers that relate to existing environmental conditions, in three islands and around the tower lines, and gantries and areas with potential impacts due to project implementation. In addition, secondary data was collected from published data from GoSL documents, 2012 population census statistics data, as well as from authorities such as CEB, MoPE and other departments.

13. Based on the Central Environmental Authority (CEA) Guidelines of GoSL, construction of transmission lines above 50 kV which will be longer than 10 km falls within prescribed projects requiring either an EIA or IEE as per the National Environmental Act. The proposed distribution projects are not covered in this category. However, an initial assessment has been done in this report to determine the extent of impacts as per the ADB's SPS 2009. The IEE report conforms to the Ministry of Mahaweli Development and Environment guidelines and regulations and is consistent with ADB's SPS 2009.

C. Applicable Environmental and Other Legislations

14. A large number of recurrent and non-recurrent activities under establishment of tower lines, rural electrification schemes and gantries are presently not covered by the National Environmental Act (NEA). **Annex 1** indicates the applicable laws and regulations, which are necessary for the proposed project activities.

II. DESCRIPTION OF THE PROJECT

A. The Project

15. Supporting Electricity Supply Reliability Improvement Project consists of the following components.

Component 1: Renewable energy development
- i. Hybrid renewable energy systems in small isolated islands
- ii. Productive energy use for small isolated islands and rural communities
- iii. Renewable energy based microgrid pilot project

Component 2: Reliability improvement of the medium voltage network
Component 3: Rural electrification and distribution performance monitoring
Component 4: Reactive Power Management in the Transmission System

B. Component 1: Renewable Energy Development

- **Hybrid renewable energy systems in small isolated islands**

16. The islands of Analaitivu, Delft and Nainativu, located off the western coast of the northern Jaffna peninsula, are currently served by CEB. Under the proposed project, these three islands will be provided with hybrid renewable energy systems. The proposed hybrid systems will consist of solar PV and wind turbines to supplement the diesel generators. Battery storage will be used to store renewable generation when the demand is low and used during night time when the demand is high. The diesel generators and the wind turbines are connected to an alternating current (ac) bus bar which is connected to the outgoing distribution line via a 400 V/11 kV step-up transformer. The solar PV and the battery storage are connected to a dc bus bar. An ac/dc converter couple the two bus bars and facilitate transfer of power between generating sources, battery storage and the load. Below are the capacities of each generating technology used at each island:

Table 3: Capacities of Each Generating Technology Used at Each Island

	Unit	Analaitivu	Delft	Nainativu
Solar PV				
Total Capacity	kW_p	200	400	250
Unit Capacity	W_p	300	300	300
No. of Units		700	1400	850
Unit Dimension	m^2	2	2	2
Overall Footprint	ha	0.4	0.8	0.5
Wind				
Total Capacity	kW	60	160	0
Unit Capacity	kW	10	10	0
No. of Units		6	16	0
Hub height	m	20	20	20
Diesel				
Total Capacity	kW	200	550	450
Generator 1	kW	100	200	150
Generator 2	kW	100	350	300

17. Table 4 summarizes the present electricity supply situation of these three islands.

Table 4: Present Condition of Electricity Supply in the Islands

Island	Analaitivu	Delft	Nainativu
Distance from main access point on the Jaffna mainland (km)	5	10	2
Population	1,804	4,502	2,861
Households	516	1,328	874
Diesel generators	1×250 kVA 1×100 kVA 1×180 kVA	3×250 kVA	1×500 kVA 2×250 kVA
Operating hours per day	24	24	24
Average daily maximum demand (kW)	45 kW	145 kW	151 kW
Existing MV line length (km)	-	7.5	3.5
Existing LV line length (km)	14.1	15.2	25.8
Existing step-up transformers	-	1×250 kVA	2×250 kVA
Existing distribution substations	-	4×100 kVA	1×250 kVA 1×160 kVA
Electrification ratio	38%	47%	60%

MV: medium voltage (11 kV), LV: low voltage (400 V)

18. Medium Voltage distribution is available only in Delft and Nainativu islands, and the existing MV network covers only certain parts of these islands. CEB is presently in the process of extending the MV network in Delft and Nainativu, to fully serve each island. However, there is no MV network in the Analaitivu, and electricity generated is distributed only through the LV network. A new MV network is presently being constructed by CEB in Analaitivu.

19. These three islands are proposed to be supplied with hybrid renewable energy systems which include a combination of diesel generators, solar PV, wind and battery storage system, designed to cater to the existing and future electricity requirements. For the hybrid power systems, about 40% of generation will be by renewable energy sources, replacing that much of diesel generation in the three islands.

Table 5: Proposed Hybrid Renewable Energy Systems

Island	New Diesel Generators	Solar Photovoltaic (PV)	Wind	Lithium-ion Battery Storage
Analaitivu	100 kW, 100 kW	200 kW_p	60 kW	200 kWh
Delft	350 kW, 200 kW	400 kW_p	160 kW	400 kWh
Nainativu	300 kW, 150 kW	250 kW_p	-	300 kWh

kW_p: peak output of solar PV

- **Productive energy use for small isolated islands and rural communities**

20. The project will promote and strengthen energy-based livelihoods through access to electrical appliances and technologies, emerging with the availability of electricity for production and marketing of traditional crafts and other similar local manufacturing activities. The project aims to provide:

(a) energy-based livelihoods with focus on women's microenterprises developed – target 50 microenterprises established, 100% below-poverty-line households and at least 20% female headed households participating;
(b) renewable energy technology-based local infrastructure development (a sea water desalination plant, small water storage tanks, an ice-making factory, refrigeration facilities, public/street lighting, others);
(c) end-user education for the safe and efficient use of electricity and electrical equipment – target of at least 50% women's participation; and
(d) technical and skills training to avail of employment and livelihood opportunities – target of 100% below-poverty-line households and at least 50% women's participation.

- **Renewable energy based microgrid pilot project**

21. With the objectives of (i) Develop a renewable energy microgrid to establish and examine its feasibility as an extension to the conventional utility distribution system, (ii) Catalyse adoption of distributed generation as a means of improving network efficiency and demand side management and (iii) Validate the effectiveness of dc electricity supply as an energy efficiency measure, a microgrid pilot project is proposed under this project by Lanka Electricity Company (Pvt) Ltd. The proposed microgrid pilot project will include 300 kW_p of solar PV, 300 kW inverter, 120 kWh battery storage, 400 kVA diesel generator and a microgrid central management system.

C. Component 2: Reliability Improvement of the Medium Voltage Network

22. When electrifying rural areas over the past years, the MV network has been gradually extended radially, and the system had not been adequately reinforced to cater to such extensions. Higher voltage drops and higher distribution losses are observed in the MV tower lines. Capacities of some of the MV lines are not adequate for further extensions and the distribution system reliability is also reduced owing to using radial lines for rural MV network extensions.

23. MV distribution system development studies covering a 10 year planning period are conducted by each distribution division of CEB, once every two years. While identifying the present status of the network, this study formulates suitable MV distribution system development proposals to cater to the future demand on the system, efficiently and at optimum levels, while meeting the statutory regulations and utility norms. Several MV distribution system development proposals of the four divisions of CEB were selected to be financed under this project. The MV project component will benefit about 450,000 consumers (consumer accounts) by improving their reliability level and reduce more than 15 GWh of losses annually

24. The project includes new 33 kV tower lines using bare conductors, gantries and 33 kV aerial bundled conductor (ABC) lines that have been proposed by each distribution division. Additionally, 33 kV auto reclosers and 33 kV load break switches are included in the project aiming at increasing the reliability and operational flexibility of the system.

25. Overhead bare conductors are more vulnerable to frequent failures as a result of salt accumulation and this results in lower reliability in the supply. Further, there are difficulties in maintaining clearances for overhead bare-conductor lines in populated areas. ABC lines are insulated and require minimal clearance to existing vegetation.

26. Table 6 summarizes the sub-projects under this component.

Table 6: Subprojects for Reliability Improvement of the MV Network

Component	CEB Distribution Division 1	CEB Distribution Division 2	CEB Distribution Division 3	CEB Distribution Division 4	Total
33 kV Lynx DC tower lines (km)	67	57.5	99	47	**270.5**
33 kV 2SSBB tower gantries	3	4	3	3	**13**
33 kV ABC lines (km)	35	-	30	15	**80**
33 kV load-break switches	40	65	40	30	**175**
33 kV auto reclosers	7	7	6	5	**25**

kV: kilovolt, Lynx: type of electrical conductor used, DC: double circuit, 2SSBB: two-section, single bus bar, ABC: aerial bundled conductor

- **Construction of new 33 kV tower lines using bare conductors and associated gantries**

DD1
1. 33 kV Lynx DC line from Puttalam GS to Keeriyankalliya
2. 33 kV Lynx DC line from Mallawapitiya GS to Ratmalgoda
3. 33 kV Lynx DC line from Maho GS to Maeliya

DD2
4. 33 kV Lynx DC line from Wimalasurendra GS to Maskeliya
5. 33 kV Lynx DC line from Ampara GS to Uhana
6. 33 kV Lynx DC line from Kappalthurai to the switching gantry at 6th mile post
7. 33 kV Lynx DC line from Irakkandy to Kumburupitiya
8. 33 kV Lynx DC line from the switching gantry at Choisy to Thawalantenna
9. 33 kV Lynx DC line from Kegalle GS to switching gantry at Gevilipitiya

DD3
10. 33 kV Lynx DC line from Badulla GS to Ella and a switching Gantry at Ella
11. 33 kV Lynx DC line from Mahiyangana GS to Bible
12. 33 kV Lynx DC line from Ratnapura GS to Idangoda
13. 33 kV Lynx DC Line from Monaragala GS to Wellawaya

DD4
14. 33 kV Lynx DC line from Warukandeniya to Morawaka
15. 33 kV Lynx DC line from switching gantry Elpitiya 11th mile post to Mattaka
16. 33 kV Lynx DC line from Matara GS to switching gantry at Yakabedda

27. To improve medium voltage (MV) network efficiency and provide system capacity to cater for load growth, construction of these express lines provide virtual power injection points to improve reliability, improve line end voltages, reduce MV losses and increase line capacities, while also improving the system operation flexibility.

DD1-1. 33 kV Lynx DC line from Puttalam GS to Keeriyankalliya (27 km)

28. A new 33 kV line from Puttalam GS to Keeriyankeliya and a new switching gantry at Keeriyankeliya: The work includes (i) construction of a 27 km 33 kV Lynx double circuit tower line from existing Puttalam GS to the new 2SSBB gantry at Keeriyankeliya, and (ii) construction of a new 2SSBB gantry at Keeriyankeliya.

29. Justification: The proposed project will connect the existing MV system in Keeriyankeliya area of the North Western Province (NWP) to the existing Puttalam GS. Load growth in the NWP is forecast to be at an average of 6.4% per year over the two-year planning period 2015-2017. The electrification level of NWP as at mid-2014 was 95% and the energy loss in the MV system was 1.7%. Construction of this express line provides power injection to 33 kV systems in Keeriyankeliya area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33kV two section single busbar (2SSBB) switching gantry at Keeriyankalliya is required to connect the above 33 kV backbone line from Puttalam GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD1-2. 33 kV Lynx DC line from Mallawapitiya GS to Ratmalgoda (16 km)

30. A new 33 kV line from Mallawapitiya GS to Rathmalgoda and a new switching gantry at Rathmalgoda: The work includes (i) construction of a 16 km 33 kV Lynx double circuit tower line from existing Mallawapitiya GS to the new 2SSBB gantry at Rathmalgoda, and (ii) construction of a new 2SSBB gantry at Rathmalgoda.

31. **Justification**: The proposed project will connect the existing MV system in Rathmalgoda area of NWP to the existing Mallwapitiya GS. Load growth in the NWP is forecast to be at an average of 6.4% per year over the two planning period 2015-2017 The electrification level of NWP as at mid-2014 was 95% and the energy loss in the MV system was 1.7%. Construction of this express line provides power injection to 33 kV systems in Rathmalgoda area which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33kV two section single busbar (2SSBB) switching gantry at Rathmalagoda is required to connect the above 33 kV backbone line from Mallawapitiya GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD1-3. 33 kV Lynx DC line from Maho GS to Ma-Eliya (24 km)

32. A new 33 kV line from Maho GS to Maeliya and a new switching gantry at Maeliya: The work includes (i) construction of a 24 km 33 kV Lynx double circuit tower line from existing Maho GS to the new 2SSBB gantry at Maeliya, and (ii) construction of a new 2SSBB gantry at Ma-Eliya.

33. **Justification:** The proposed line will connect the existing MV system in Maeliya area of the NWP to the existing Maho GS. Load growth in the NWP is forecast to be at an average of 6.4% per year over the two year planning period 2015-2017 The electrification level of NWP as at mid-2014 was 95% and the energy loss in the MV system was 1.7%. Construction of this express line provides power injection to 33 kV systems in Maeliya area which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33kV two section single busbar (2SSBB) switching gantry at Ma-Eliya is required to connect the above 33kV backbone line from Maho GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD2-1. 33 kV Lynx DC line from Wimalasurendra GS to Maskeliya (10 km)

34. A new 33 kV line from Wimalasurendra GS to Maskeliya and a new switching gantry at Maskeliya: The work includes (i) construction of a 10 km 33 kV Lynx double circuit tower line from existing Wimalasurendra GS to the new 2SSBB gantry at Maskeliya, and (ii) construction of a new 2SSBB gantry at Maskeliya.

35. **Justification:** The proposed line will connect the existing MV system in Maskeliya area of the Central Province (CP) to the existing Wimalasurendra GS. In CP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 6.0% and 4.0% respectively over the ten-year planning period 2015-2024. The electrification level in CP as at end of 2014 was 98% and the energy loss in the MV system was 1.9%. Construction of this express line provides power injection to 33 kV systems in Maskeliya area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantry at Maskeliya is required to connect the above 33 kV backbone line from Wimalasurendra GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD2-2. 33 kV Lynx DC line from Ampara GS to Uhana (10 km)

36. A new 33 kV line from Ampara GS to Uhana and a new switching gantry at Uhana: The work includes (i) construction of a 10 km 33 kV Lynx double circuit tower line from existing Ampara GS to the new 2SSBB gantry at Uhana, and (ii) construction of a new 2SSBB gantry at Uhana.

37. **Justification:** The proposed line will connect the existing MV system in Uhana area of the Eastern Province (EP) to the existing Ampara GS. In EP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 7.0% and 3.7% respectively over the ten-year planning period 2015-2024. The electrification level of EP as at end of 2014 was 88% and the energy loss in the MV system was 2.9%. Construction of this express line provides power injection to 33 kV systems in Uhana area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33kV two section single busbar (2SSBB) switching gantry at Uhana is required to connect the above 33kV backbone line from Ampara GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD2-3. 33 kV Lynx DC line from Kapplathurai GS to the switching gantry at 6th mile post (15 km)

38. A new 33 kV line from Kappalthurai GS to switching gantry at 6th mile post: The work includes (i) construction of a 15 km 33 kV Lynx double circuit tower line from Kappalthurai GS which is under construction to the existing switching gantry at 6th mile post.

39. **Justification:** This proposed line will connect the existing MV system in Nilaveli area of the EP to the Kapplthurai GS which is under construction. In EP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 7.0% and 3.7% respectively over the ten-year planning period 2015-2024. The electrification level of EP as at end of 2014 was 88% and the energy loss in the MV system was 2.9%. Construction of this express line provides power injection to 33 kV systems in Nilaveli area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities.

DD2-4. 33 kV Lynx DC line from Irakkandy to Kumburupitiya (6.5 km)

40. A new 33 kV line from switching gantry at Irakkandy to switching gantry at Kumburupitiya: the work includes (i) construction of a 6.5 km 33 kV Lynx double circuit tower line from new switching gantry at Irakkandy to new switching gantry at Kumburupitiya, (ii) construction of a new 2SSBB gantry at Irakkandy, and (iii) construction of a new 2SSBB gantry at Kumburupitiya.

41. **Justification:** The proposed line will connect the existing MV systems in Irakkandy and Kumburupitiya of the EP. In EP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 7.0% and 3.7% respectively over the ten-year planning period 2015-2024. The electrification level of EP as at end of 2014 was 88% and the energy loss in the MV system was 2.9%. Construction of this express line provides power injection to 33 kV systems in Kumburupitiya area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantries at Irakkandy and Kumburupitiya are required to connect the above 33 kV backbone line to the existing MV systems in the two areas, to improve the operational flexibility of the MV system.

DD2-5. 33 kV Lynx DC line from the switching gantry at Choisy to Thawalantenna (5 km)

42. A new 33 kV line from switching gantry at Choisy to switching gantry at Thawalantenna: The work includes (i) construction of a 5 km 33 kV Lynx double circuit tower line from existing switching gantry at Choisy to existing switching gantry at Thawalantenna.

43. **Justification:** The proposed line will connect the existing MV system in Thawalantenna area of the CP to the existing gantry at Choisy. In CP, load growth of domestic and commercial retail sector and industrial and bulk supply sector forecast to be 6.0% and 4.0% respectively over the ten-year planning period 2015-2024. The electrification level of CP as at end of 2014 was 98% and the energy loss in the MV system was 1.9%. Construction of this express line provides power injection to 33 kV systems in Thawalantenna area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities.

DD2-6. 33 kV Lynx DC line from Kegalle GS to switching gantry at Gevilipitiya (11 km)

44. A new 33 kV line from Kegalle GS to switching gantry at Thawalantenna: The work includes (i) Construction of a 11 km 33 kV Lynx double circuit tower line from Kegalle GS which is under construction to proposed switching gantry at Gevilipitiya.

45. **Justification:** The proposed line will connect the existing MV system in Gevilipitiya area of the CP to the Kegalle GS, which is under construction. In CP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 6.0% and 4.0% respectively over the ten-year planning period 2015-2024. The electrification level of CP as at end of 2014 was 98% and the energy loss in the MV system was 1.9%. Construction of this express line provides power injection to 33 kV systems in Gevilipitiya area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities.

DD3-1. 33 kV Lynx DC line from Badulla GS to Ella and a switching Gantry at Ella (16 km)

46. A new 33 kV line from Badulla GS to Ella and a new switching gantry at Ella: The work includes (i) construction of a 16 km 33 kV Lynx double circuit tower line from existing Badulla GS to the new 2SSBB gantry at Ella, and (ii) construction of a new 2SSBB gantry at Ella.

47. **Justification:** The proposed line will connect the existing MV system in Ella area of the Uva Province (Uva) to the existing Badulla GS. In Uva, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 8.2% and 3.0% respectively over the ten-year planning period 2015-2024. The electrification level of Uva as at mid-2014 was 95% and the energy loss in the MV system was 2.6%. Construction of this express line provides power injection to 33 kV systems in Ella area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantry at Ella is required to connect the above 33 kV backbone line from Badulla GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD3-2. 33 kV Lynx DC line from Mahiyangana GS to Bible (30 km)

48. A new 33 kV line from Mahiyanganaya GS to Bibile and a new switching gantry at Bibile: The work includes (i) construction of a 30 km 33 kV Lynx double circuit tower line from existing Mahiyangana GS to the new 2SSBB gantry at Bibile, and (ii) construction of a new 2SSBB gantry at Bibile.

49. **Justification:** The proposed line will connect the existing MV system in Bibile area of Uva to the existing Mahiyanganaya GS. In Uva, load growth of domestic and commercial retail sector and industrial and bulk supply sector forecast to be 8.2% and 3.0% respectively over the ten-year planning period 2015-2024. The electrification level of Uva as at mid-2014 was 95% and the energy loss in the MV system was 2.6%. Construction of this express line provides power injection to 33 kV systems in Bibile area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantry at Bibile is required to connect the

above 33 kV backbone line from Mahiyanganaya GS to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD3-3. 33 kV Lynx DC line from Ratnapura GS to Idangoda (19 km)

50. A new 33 kV line from Ratnapura GS to Idangoda: The work includes (i) construction of a 19 km Lynx double circuit tower line from existing Ratnapura GS to proposed switching gantry at Idangoda.

51. **Justification:** The proposed line will connect the existing MV system in Idangoda area of the Sabaragamuva Province (Sab) to the existing Ratnapura GS. In Ratnapura, load growth of domestic and commercial retail sector and industrial and bulk supply sector forecast to be 7.1% and 3.5% respectively over the ten-year planning period 2015-2024. The electrification level of Sab as at mid-2014 was 99% and the energy loss in the MV system was 1.3%. Construction of this express line provides power injection to 33 kV systems in Idangoda area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities.

DD3-4. 33 kV Lynx DC Line from Monaragala GS to Wellawaya (34 km)

52. A new 33 kV line from Monaragala GS to Wellawaya and a new switching gantry at Wellawaya: The work includes (i) construction of a 34 km 33 kV Lynx double circuit tower line from existing Monaragala GS to the new 2SSBB gantry at Wellawaya, and (ii) construction of a new 2SSBB gantry at Wellawaya.

53. **Justification:** The proposed line will connect the existing MV system in Wellawaya area of Uva to the existing Monaragala GS. In Uva, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 8.2% and 3.0% respectively over the ten-year planning period 2015-2024. The electrification level of Uva as at mid-2014 was 95% and the energy loss in the MV system was 2.6%. Construction of this express line provides power injection to 33 kV systems in Wellawaya area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantry at Wellawaya is required to connect the above 33 kV backbone line from Monaragala GS to the existing MV system in the area, to improve the operational flexibility of the MV system

DD4-1. 33 kV Lynx DC line from Warukandeniya to Morawaka (18 km)

54. A new 33 kV line from switching gantry at Warukandeniya to switching gantry at Morawaka: The work includes (i) construction of a 18 km 33 kV Lynx double circuit tower line from new switching gantry at Warukandeniya to new switching gantry at Morawaka, (ii) construction of a new 2SSBB gantry at Warukandeniya and (iii) construction of a new 2SSBB gantry at Morawaka.

55. **Justification:** The proposed line will connect the existing MV systems in Warukandeniya and Morawaka of the Southern Province (SP). In SP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 8.1% and 3.3% respectively over the ten-year planning period 2015-2024. The electrification level of SP

as at end of 2013 was 99.5% and the energy loss in the MV system was 1.66%. Construction of this express line provides power injection to 33 kV systems in Warukandeniya area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantries at Warukandneiya and Morawaka are required to connect the above 33 kV backbone line to the existing MV systems in the two areas, to improve the operational flexibility of the MV system.

DD4-2. 33 kV Lynx DC line from switching gantry Elpitiya 11th mile post to Mattaka (11 km)

56. A new 33 kV line from switching gantry at Elpitiya 11th mile post to and a new switching gantry at Mattaka: The work includes (i) construction of a 11 km 33 kV Lynx double circuit tower line from proposed switching gantry at Elpitiya 11th to the new 2SSBB gantry at Mattaka, and (ii) construction of a new 2SSBB gantry at Mattaka.

57. **Justification:** The proposed line will connect the existing MV system in Mattaka and Elpitiya areas of ,SP. In SP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 8.1% and 3.3% respectively over the ten-year planning period 2015-2024. The electrification level of SP as at end of 2013 was 99.5% and the energy loss in the MV system was 1.66%. Construction of this express line provides power injection to 33 kV systems in Mattaka area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities. The proposed 33 kV two section single busbar (2SSBB) switching gantry at Mattaka is required to connect the above 33kV backbone line from Elpitiya 11th mile post to the existing MV system in the area, to improve the operational flexibility of the MV system.

DD4-3. 33 kV Lynx DC line from Matara GS to switching gantry at Yakabedda (18 km)

58. A new 33 kV line from Matara GS to Yakabedda: The work includes (i) construction of an 18 km Lynx double circuit tower line from existing Matara GS to existing switching gantry at Yakabedda.

59. **Justification:** The proposed line will connect the existing MV system in Yakabedda area of the SP to existing Matara GS. In SP, load growth of domestic and commercial retail sector and industrial and bulk supply sector is forecast to be 8.1% and 3.3% respectively over the ten-year planning period 2015-2024. The electrification level of SP as at end of 2013 was 99.5% and the energy loss in the MV system was 1.66%. Construction of this express line provides power injection to 33 kV systems in Yakabedda area, which will improve reliability, line end voltages and system operation flexibility, reduce MV losses, and increase line capacities.

- **Construction of new 33 kV aerial bundled conductor (ABC) lines**

60. Proposed 33 kV ABC lines will help to eliminate frequent failures that occur due to heavy salt accumulation on bare conductor lines in coastal areas. Further, insulated ABC lines, which require minimum clearance of existing vegetation, are proposed, as a more economical solution, for locations where there are difficulties in maintaining clearances for overhead bare-conductor lines in populated areas.

61. Construction of 35 km of 33 kV ABC lines is proposed in DD1 to eliminate failures due to salt contamination. Construction of 30 km and 15 km of ABC lines are proposed in DD3 and DD4 respectively, for locations where statutory minimum clearances could not be maintained due to obstructions to existing lines.

- **Installation of 33 kV auto reclosers and 33 kV load break switches**

62. For distribution system operation coordination, 33 kV auto reclosers and load break switches, with remote control facilities, are proposed to be installed in 33 kV network in order to provide efficient fault isolation and restoration, and improve operational flexibility of the system. Auto reclosers will provide automatic fault detection and restoration on transient faults and isolation of permanent faults, covering a large area of the network. Load break switches are proposed to be installed at locations to isolate smaller sections of the system under fault conditions limiting the number of consumers so affected.

D. Component 3. Rural Electrification and Distribution Performance Monitoring

63. Non-availability of the national grid in the faraway villages is one of the major reasons for the low electrification level in certain locations, and the high cost of the grid extensions had been the main barrier to supply electricity to such locations. Under this project, 106 RE schemes including 198 km of MV lines and 393 km of LV lines are proposed to be implemented, as summarized in the Table 7. The project includes LV line extensions as given in the Table 8. There will around 35,700 benefited consumers of RE schemes and extensions among which, the majority (99%) would be household consumers. The RE component will supply electricity replacing their alternative fuel consumptions with clean electricity. About 2 million liters of kerosene is expected to be saved by electrifying these consumers in addition to the added convenience they gain by using electricity as an energy source.

Table 7: Proposed RE Schemes in each CEB Distribution Division

CEB Distribution Division	No. of Schemes	Line Length MV (km)	Line Length LV (km)	Number of Benefited Consumers
1	19	47	113	1,650
2	61	83	182	3,228
3	24	65	91	795
4	2	3	7	32
Total	**106**	**198**	**393**	**5,705**

Table 8: Proposed LV Extensions

Distribution Division	LV (km)	Number of Benefited Consumers
DD1	1,073	13,384
DD2	732	10,609
DD3	54	1,093
DD4	120	4,916
Total	**1,979**	**30,005**

64. Both technical losses and non-technical losses are present in any distribution network and it is very important to measure these losses and take necessary actions to reduce them. Therefore, a proper distribution loss management program is required in each distribution division and substation metering plays a major role in such a strategy. There are 26,826 distribution transformers in all four divisions of CEB[1], and only 56 of them are equipped with programmable/digital meters. Under this project, 25,000 programmable distribution substation meters with remote meter-reading facility are proposed to be installed. Number of programmable meters allocated for each division will be decided later.

E. Component 4: Reactive Power Management in the Transmission System

65. The Long Term Transmission Development (LTTDP) study conducted by CEB recommends several transmission development proposals to be implemented to strengthen the transmission network of the country. These include the development of new transmission lines and grid substations (GS), augmentation of existing GS, and the addition of special equipment to improve the quality of service delivery, efficiency and reliability of the system. The reactive power management component is expected to avoid more than 7 GWh of energy losses per year. This is in addition to the improved system reliability.

66. In addition to active power that converts electrical energy to another useful form of energy, reactive power is also required to establish and maintain the magnetic fields in electrical equipment and appliances used by customers. Additionally, transmission and tower lines as well as transformers, too, require reactive power for their operations. Such reactive power requirements may either be supplied from power generating plants, or supplied from capacitors fixed at various locations in the system. To improve the provision of reactive power closer to the load centers in the Western Province, and to improve reliability of the transmission system in the event of disturbances in the transmission system, respectively, CEB proposes the following:

(a) Installation of 100 Mvar breaker-switched capacitors (BSC) at the 132 kV bus bar of the existing Pannipitiya GS (including a new 132 kV BSC bay), to control the voltage of the 220 kV bus bar
(b) Installation of a +100/-50 Mvar static var compensator (SVC) at the 220 kV bus bar of the existing Biyagama GS (including a new 220 kV SVC bay), to control the voltage of the 220 kV bus bar during dynamic conditions

F. Location

67. The proposed sub-projects are located in different areas of the country including Northern, Northern Central, Central, and Eastern provinces. Table 9 indicates details of the proposed sub-project locations and Table 10 gives the Land ownership details for gantry based switching stations.

[1] CEB Statistical Digest 2014

Table 9: Different Locations of Proposed Subprojects.

Sub-project	DS division	District	Province
Component 1: Renewable energy development	Analaitivu, Delft, Nainativu	Jaffna	Northern
Component 2: Reliability improvement of the medium voltage network			
DD1			
Puttalam GS to Keeriyankalliya	Puttalam	Puttalam	North Western Province
Mallawapitiya GS to Rathmalgoda	Mallawapitiya, Polgahawela	Kurunegala	North Western Province
Maho grid to Ma-Eliya gantry	Mahawa, Polpithugama	Kurunegala	North Western Province
DD2			
Wimalasurendra GS to Maskeliya Gantry	Ambagamuwa Korale	NuwaraEliya	Central Province
Ampara GS to Uhana Gantry		Ampara	Eastern Province
Kappalthurai GS to 6th Mile Post gantry	Trincomalee	Trincomalee	Eastern Province
Irankandy gantry to Kumburupitiya gantry		Trincomalee	Eastern Province
Choisy gantry to Thawalantenna		NuwaraEliya	Central Province
Kegalle GS to Givilipitiya gantry	Kegalle, Aranayaka	Kegalle	Central Province
DD3			
Badulla GS to Ella	Badulla, Ella	Badulla	Uva Province
Mahiyanganaya GS to Bibile	Badulla, Passara	Badulla, Monaragala	Uva Province
Ratnapura GS to Idangoda via Ketaliyanpella	Ratnapura, Ayagama	Ratnapura	Sabaragamuwa Province
Monaragala GS to Wellawaya	Monaragala, Buttala	Monaragala	Uva Province
DD4			
Morawaka to Warukandeniya	Malimboda, Thihagoda	Galle, Matara	Southern Province
Elpitiya 11th Mile Post to Mattaka	Elpitiya, Niyagama	Galle	Southern Province
Matara GS to Yakabedda	Matara, Malimboda, Akuressa	Matara	Southern Province
Component 3: Rural electrification and distribution performance monitoring			North Central, Uva, Southern, Central
Component 4: Reactive Power Management in the Transmission System	Pannipitiya, Biyagama	Colombo	Western Province

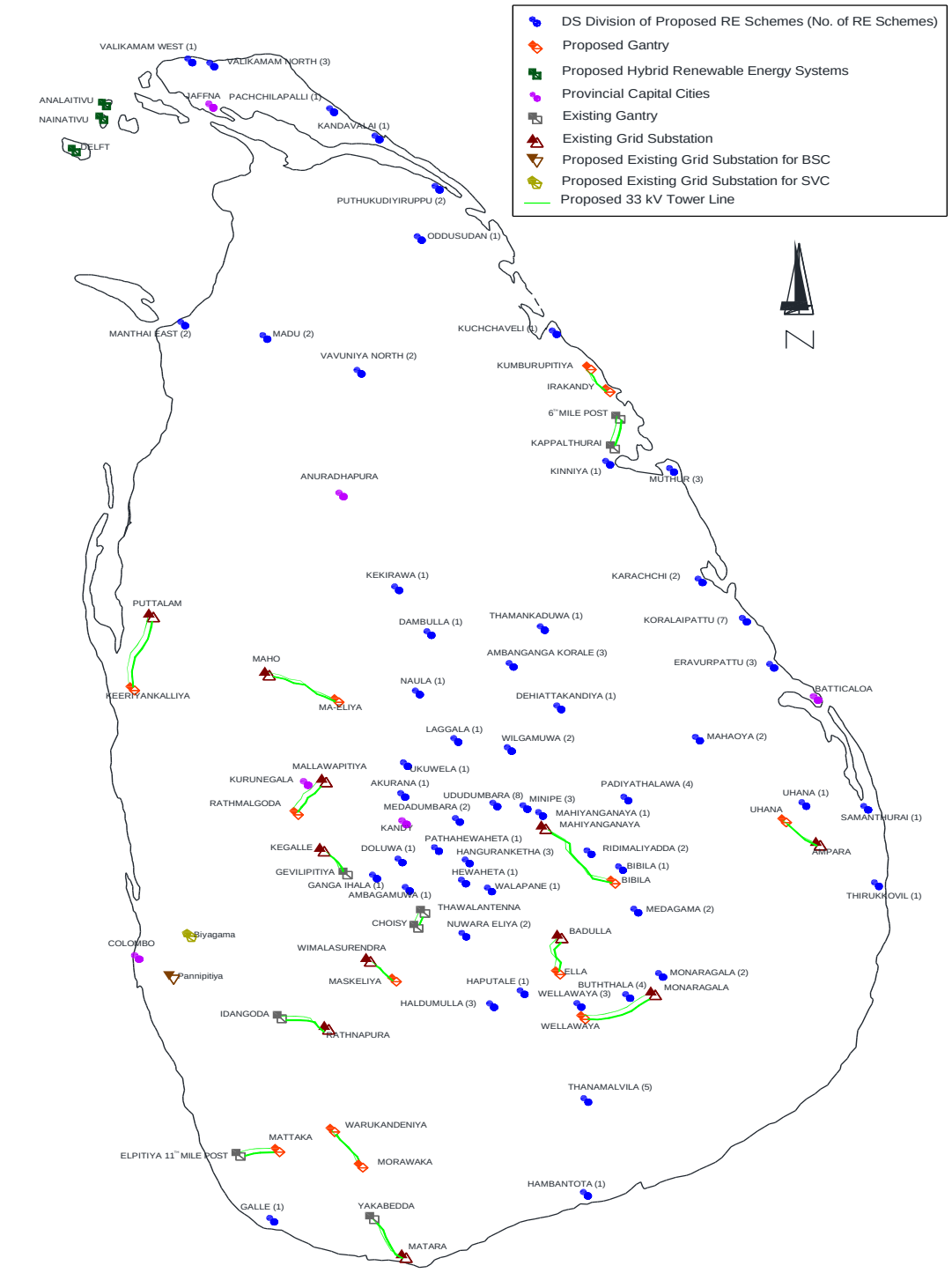
Table 10: Ownership Details Gantry Based Switching Stations

Sub-project	Gantry Name	Area	Ownership
DD1		m^2	
Puttalam GS to Keeriyankalliya	Keeriyankalliya	145 m^2	Private land
Mallawapitiya GS to Ratmalgoda	Rathmalgoda	250 m^2	Private land (belong to the temple)
Maho GS to Ma-Eliya gantry	Ma-Eliya	250 m^2	Private land
DD2			
Wimalasurendra GS to Maskeliya Gantry	Maskeliya	250 m^2	Private land (belong to the temple)
Ampara GS to Uhana Gantry	Uhana	300 m^2	CEB land
Irankandy gantry to Kumburupitiya gantry	Irankandy Kumburupitiya	145 m^2	Govt. land
DD3			
Badulla GS to Ella	Ella	145 m^2	Plantation company (Tea Land)
Mahiyanganaya GS to Bibile	Bibile	250 m^2	CEB land
Monaragala GS to Wellawaya	Wellawaya	250 m^2	Govt. land
DD4			
Morawaka to Warukandeniya	Morawaka	145 m^2	Private land
Elpitiya 11th Mile Post to Mattaka	Warukandeniya	145 m^2	Private land
Matara GS to Yakabedda	Mattaka	250 m^2	Govt. land

68. Figure 1: provides general location map for all projects proposed under the loan. Figures 2-9 provides topographical maps (on 1:50,000 scale) that show the proposed tower line routes for the following sub-projects:

Sub-projects	Figure 1
Mallawapitiya GS to Ratmalgoda	Figure 2
Maho grid to Ma-Eliya gantry	Figure 3
Wimalasurendra GS to Maskeliya Gantry	Figure 4
Kegalle Grid to Givilipitiya gantry	Figure 5
Mahiyanganaya GS to Bibile	Figure 6
Monaragala GS to Wellawaya	Figure 7
Elpitiya 11th Mile Post to Mattaka	Figure 8
Morawaka to Warukandeniya	Figure 9

Figure 1: Map of Sri Lanka showing details of Subprojects in all Components



DS: Divisional Secretariat
RE Shemes:Rural Electrification Schemes
Type of proposed 33kV tower lines: Double circuit lines with Lynx conductor
Type of proposed gantries: Two-section single bus bar
BSC: Breaker Switched Capacitors
SVC: Static Var Compensator

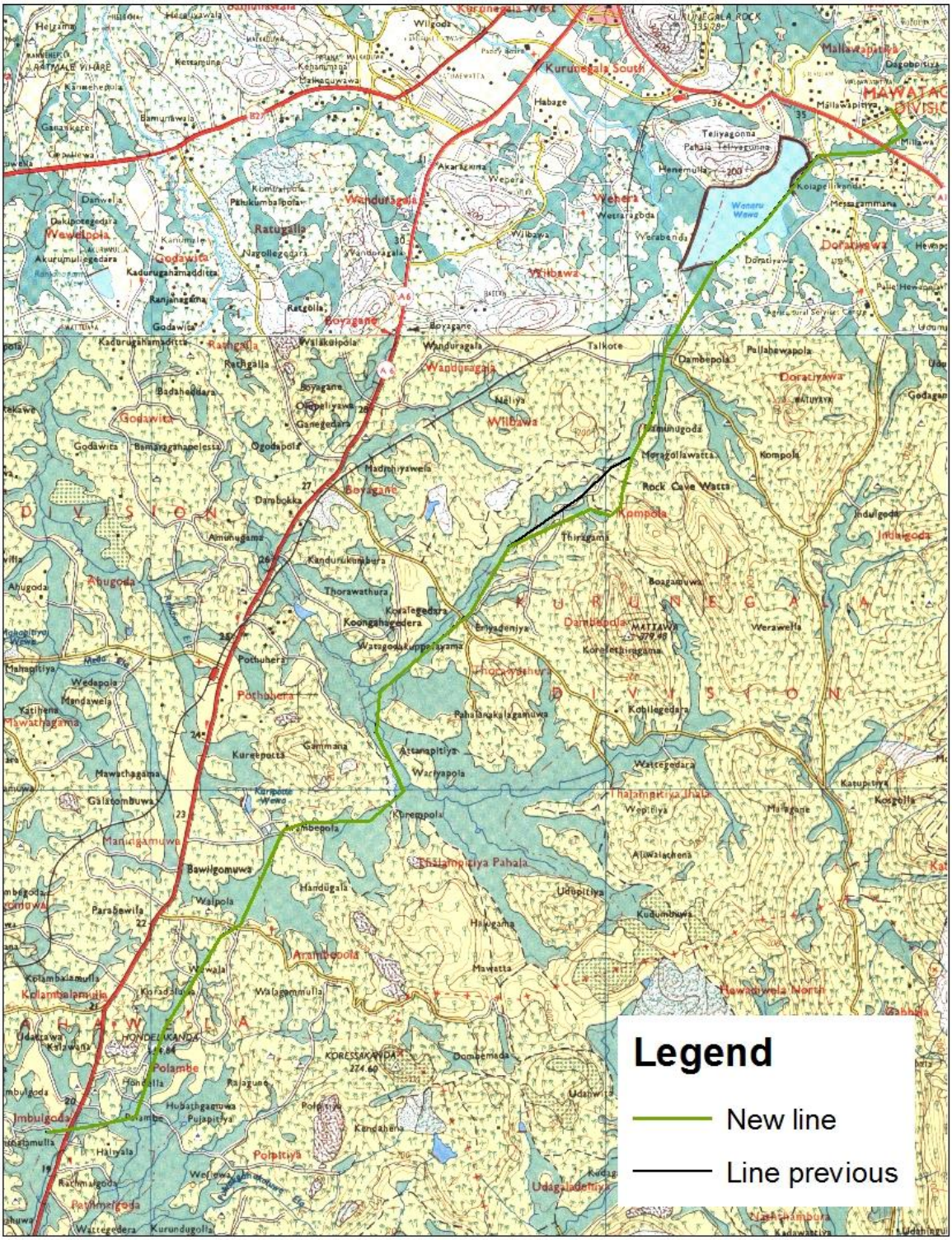


Figure 2: Mallawapitiya GS to Rathmalgoda 33 kV line- 16 km

Figure 3: Maho GS - Ma-Eliya 33 kV line (Location on topographic sheet) 24 km

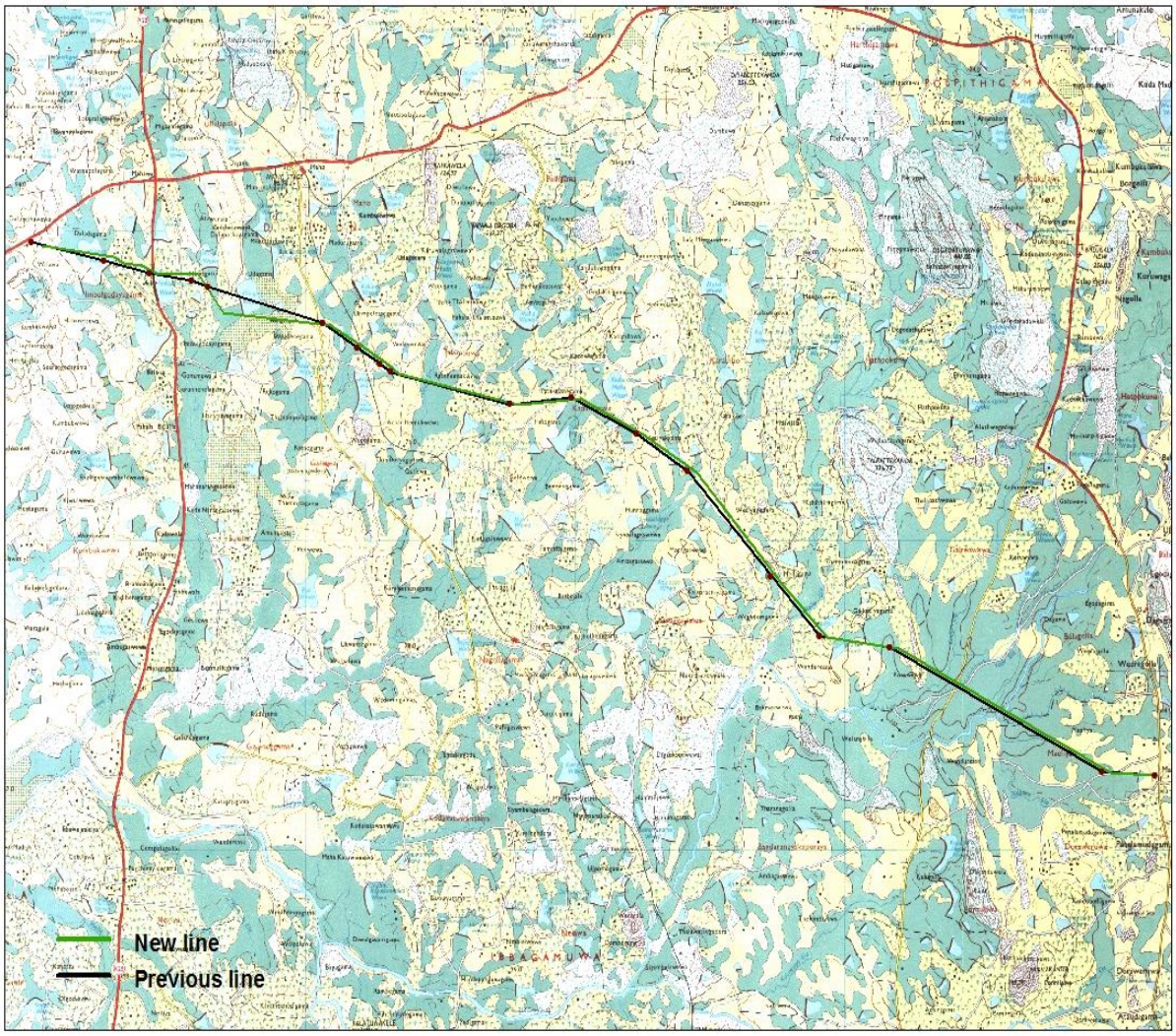


Figure 4: Wimalasurendra GS to Maskeliya gantry (Location on topographic sheet) 10 km

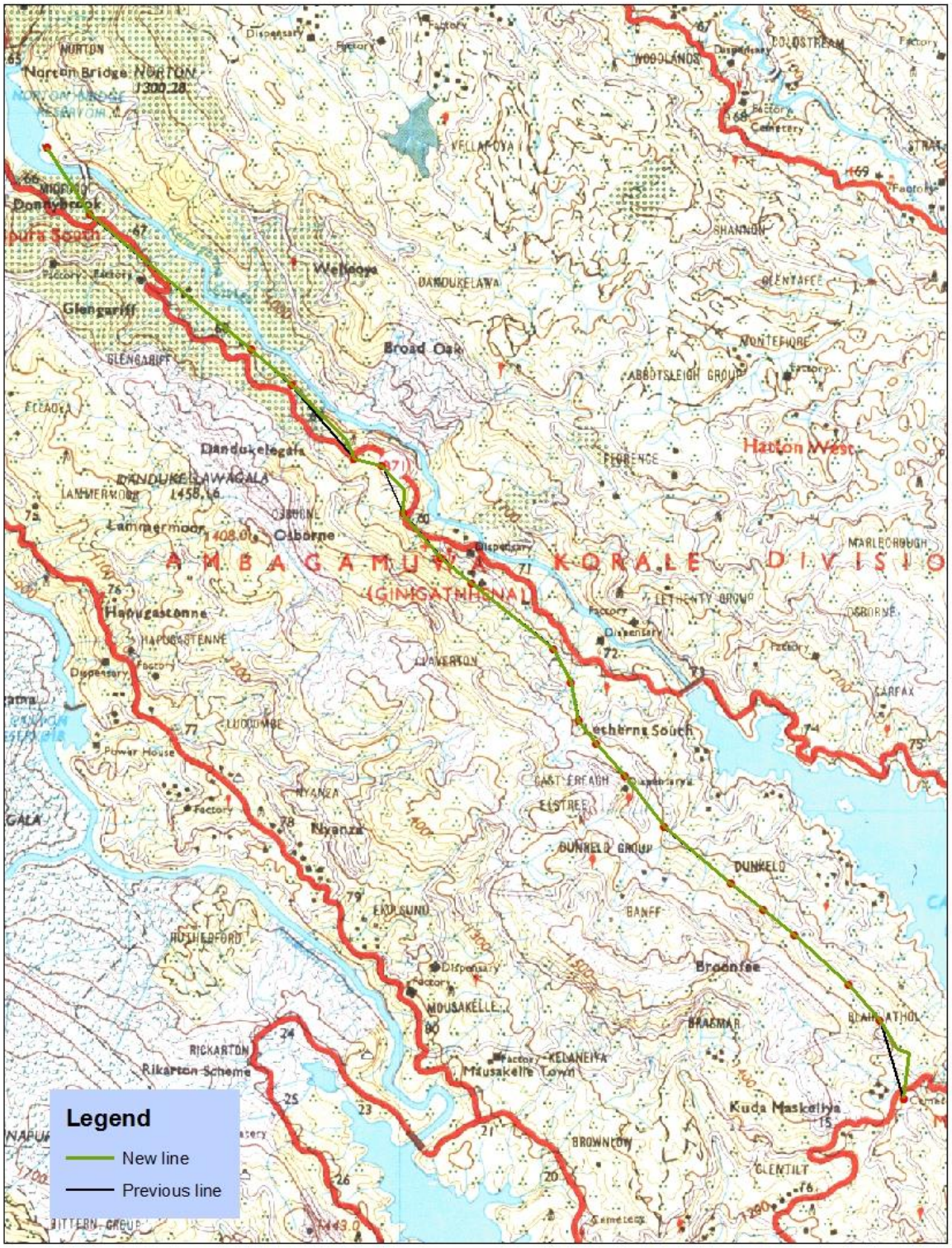


Figure 5: Kegalle GS to Gevilipitiya 33 kV line- 11 km

Figure 6: Mahiyanana GS to Bibile 33 kV line - 30 km

Figure 7: Monaragala GS to Wellawaya 33 kV line- 34 km

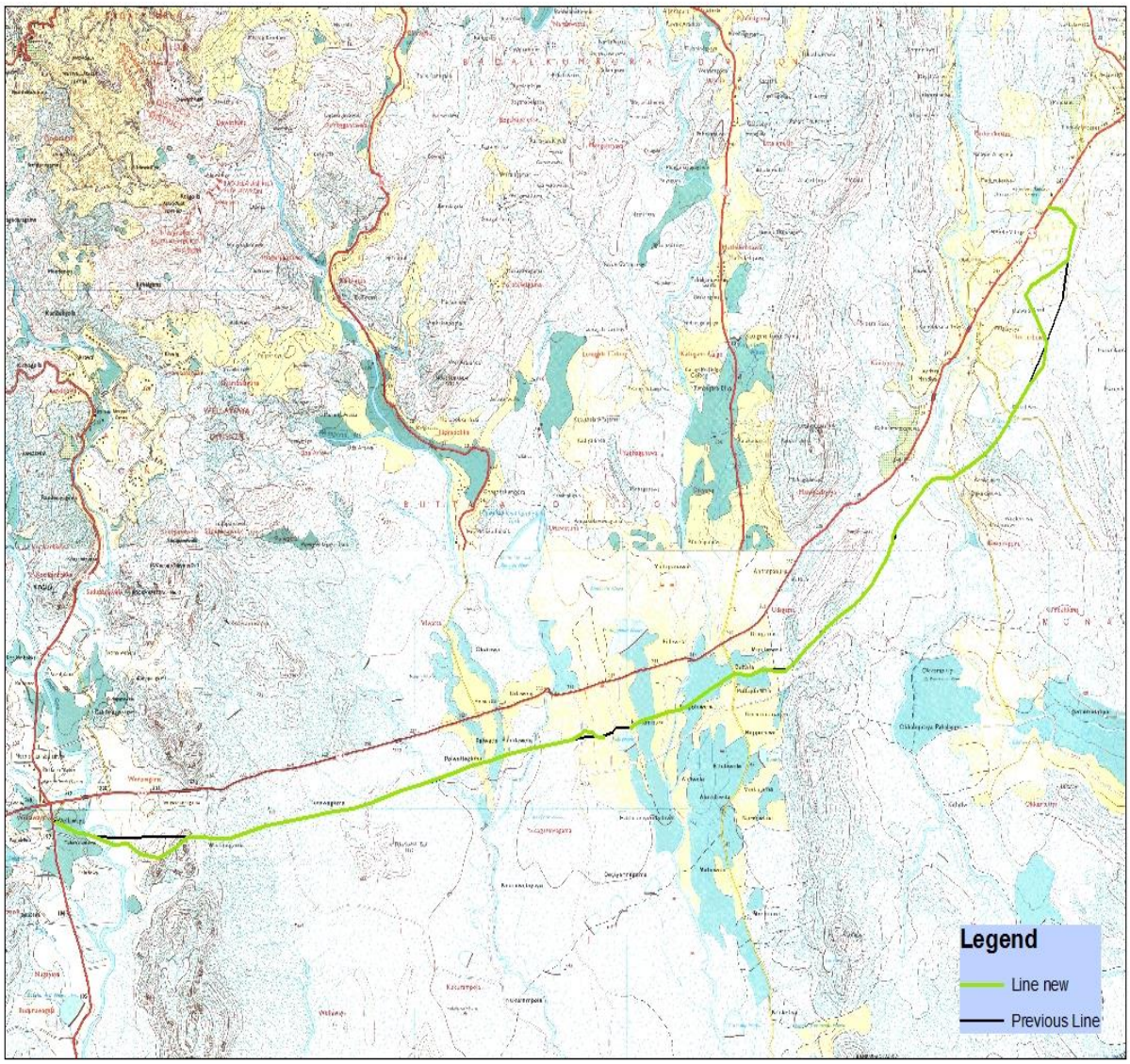
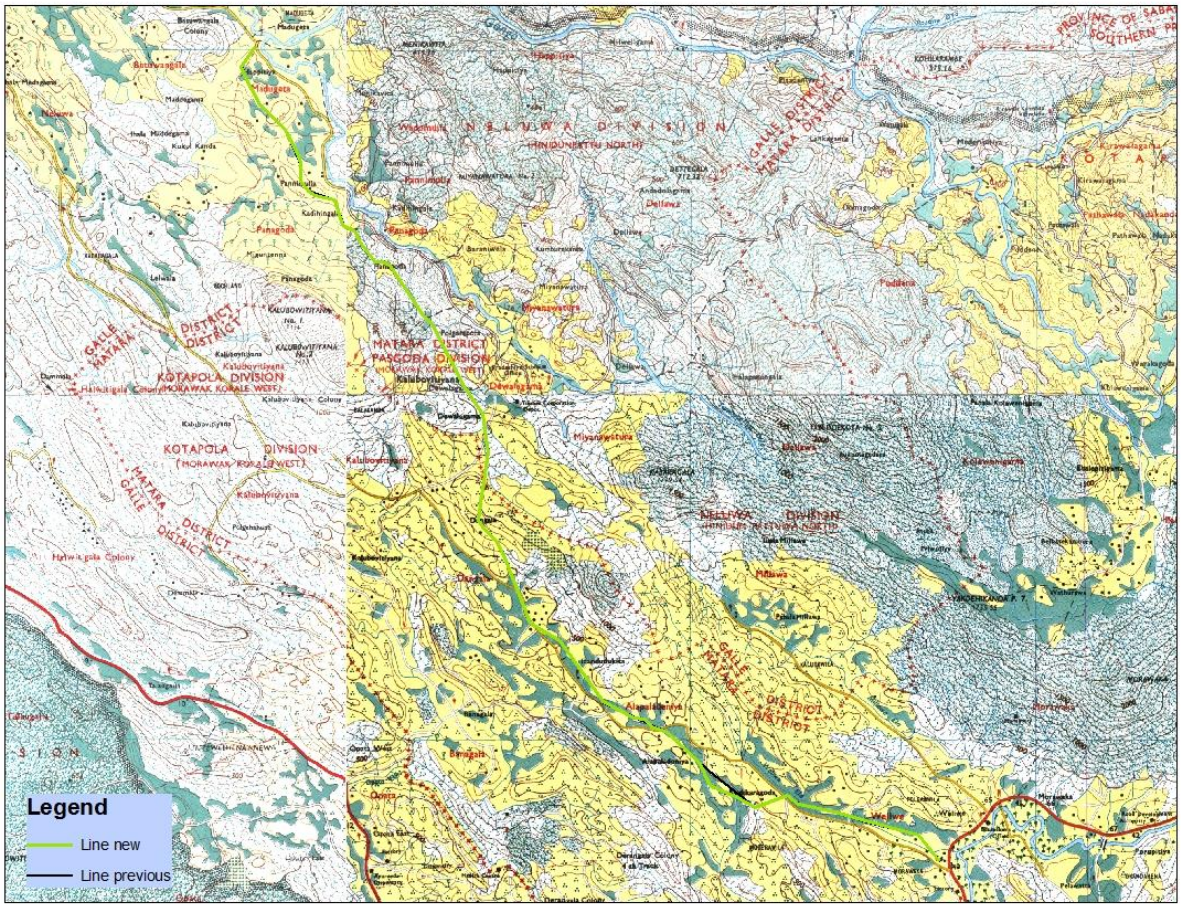


Figure 8: Elpitiya- Mattaka 33 kV line- 11 km

Figure 9: Morawaka- Warukandeniya 33 kV line -18 km



G. Size and the Magnitude of the Operation

- **Component 1: Renewable energy development**

69. Hybrid renewable energy systems are proposed in three islands, Delft, Nainativu and Analaitivu, all located off the western coast of Jaffna peninsula. Delft Island, the largest of the three, approx 50 km^2, situated about 10 km from mainland, is the second largest island situated within the territorial waters in Sri Lanka. The Delft National Park, 1846.28 ha, was declared on 19th June 2015, by the Department of Wildlife Conservation for conservation of wild horses is situated in the southern part of the island and it occupies about 37% of the land area. The land identified for the mini-grid system was about 800 m outside the National Park and belongs to the government. The project site consists of scattered shrubs and is periodically waterlogged due to the north east monsoon rains from November to January. The other two islands do not include any Protected Area or National Reserves. The sites selected for the project are scrublands and grasslands close to the coastal area. Two desalanisation plants will be established in the coastal areas of Nainativu and Analaitivu Islands.

- **Component 2: Reliability improvement of the medium voltage network**

CEB Distribution Division DD1

Puttalam - Keeriyankalliya 33 kV

70. 33 kV tower line Puttalam GS to Keeriyakalliya gantry (27 km)

71. The 27 km, 33 kV tower line from Puttalam GS to Keeriyankalliya traverses through paddy fields, and degraded lands (65.5%) home gardens (18.4%) and coconut plantations 16%). The line is not passing through any natural forest areas. No major environmental issues have been identified, line traverses mainly through man-modified habitats in the dry zone of the country. Temporary impacts are foreseen on loss of crops during construction and loss of some trees is also anticipated. This is a tower line and the impacts are quite limited since the right of way is minimal. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The line has approximately 104 lattice towers[2] and the conductors shall be single Lynx per phase, double circuit line.

Mallawapitiya- Rathmalgoda 33 kV

72. 33 kV tower line Mallawapitiya GS to Rathmalgoda gantry (16 km)

73. The 16 km, 33 kV tower line from Mallawapitiya GS to Rathmalgoda proposed gantry, passes through mainly paddy fields and degraded lands (92.4%), home gardens (7.4), tanks (wewa) (4.2%) and coconut lands (0.9%). It crosses two main roads, Mallawapitiya-Rambodagalla road between Angel Point (AP)1 and AP2, and Kurunegala- Kandy road between AP2 and AP3. It also crosses Bulugolla- Dombemada road between AP 20 and AP 21 and Ambepussa - Kurunegala road between AP24 and 25 before reaching the land earmarked for

[2] Calculated on basis of @4 towers per km line

the Rathmalgoda gantry. It traverses along the southern edge of Vennaru wewa (tank) for about 1.7 km between AP4 and AP6. Then it follows the RoW through paddy fields. Home gardens can be seen between two stretches of paddy fields. Temporary impacts are foreseen on loss of crops during construction and loss of trees (144) is also anticipated. This is a tower line and the impacts are quite limited since the right of way is minimal. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of RoW. The line has approximately 25 angle towers and 42 suspension lattice towers and the conductors shall be single Lynx per phase, double circuit line. See Annex 4, Table 4.1 & 4.9.

33 kV Rathmalgoda Gantry

74. The land identified for the Ratmalgoda gantry is a private land belongs to a temple in the village. CEB will get the land (0.03 Ha) from the temple. The Gantry shall require an area of about 250 sq. m. It has 02 nos., incoming lines and 04 nos. outgoing lines. At the gantry, incoming lines shall be with load break switches and the outgoing lines shall be with auto-reclosures.

Maho GS to Ma-Eliya 33 kV

75. 33 kV tower line Maho GS to Ma-Eliya gantry (24 km)

76. The 24 km, 33 kV tower line from Maho GS to Ma Eliya proposed gantry traverses many paddy fields and degraded lands (62%), home gardens (26%), coconut lands (4.5%) and seasonal tanks (3.5%). A number of coconut trees and home garden trees have to be fell. The number of trees to be cut down for ROW is 195 for the line. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. Approximately the line has 19 angle towers and 51 suspension lattice towers[3] and the conductors shall be single Lynx per phase double circuit line. See Annex 4, Table 4.2 & Table 4.10

Ma-Eliya Gantry

77. The land identified for the construction of Ma Eliya Gantry is a private land with coocnut and other tree species. CEB will purchase the land (0.03 Ha) from the owner. The Gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 04 nos. outgoing lines. At the gantry, incoming lines shall be with load break switches and the outgoing lines shall be with auto-reclosures.

CEB Distribution Division DD2

Wimalasurendra GS to Maskelliya 33 kV

78. 33 kV tower line from Wimalasurendra GS to Maskeliya gantry (10 km)

79. The 10 km, 33 kV tower line from Wimalasurendra GS to Maskeliya gantry traverses mainly through tea estates (92%), home gardens (4.5%) and eucalyptus plantations (3.5%)

[3] Calculated on basis of @5 towers per km line).

established by the tea estates. It crosses Norton Bridge to Hatton road three times between AP1 and 3. No major environmental issues have been identified as line passing through tea plantations. Few Eucalyptus and Pinus trees (70) have to be fell for the RoW. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. Approximately the line has 30 nos. lattice towers (19 angle towers and 11 suspension towers) and the conductors shall be single Lynx per phase double circuit line. See Annex 4, Table 4.3 & Table 4.11

33 kV Maskeliya Gantry

80. The land allocated for Maskeliya gantry is a private land belong to the temple in KudaMaskeliya (0.03 ha) free from any use, adjacent to the Hatton- Maskeliya main road. The gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 04 nos. outgoing lines. At the gantry, incoming lines shall be with load break switches and the outgoing lines shall be with auto-reclosures.

Ampara to Uhana 33 kV

81. 33 kV tower line from Ampara GS to Uhana gantry (10 km)

82. The 10 km, 33 kV tower line from Ampara GS to Uhana gantry traverses mainly through paddy fields and degraded lands. No major environmental issues has been identified, this line is situated in the dry zone of the country. This line is not passing through natural forest areas. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. Approximately the line has 40 nos. lattice towers and the conductors shall be single Lynx per phase double circuit line.

Kappalthurai GS to 6th Mile Post 33 kV

83. 33 kV tower line from Kappalthurai GS to 6th mile post gantry (15 km)

84. The 15 km, 33 kV tower line from Kappalthurai GS to 6th Mile Post gantry traverses mainly through paddy fields and degraded lands (53%), teak plantations established by the Forest Department (40%) and home gardens (7%). A saltern is located next to the line towards inland. The line is located in the dry zone of the country. Temporary impacts are foreseen on loss of crops during construction and loss of teak trees in the ROW is anticipated. This is a tower line and the impacts are quite limited since the right of way is minimal. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The line has approximately 18 angle towers and 42 suspension lattice towers and the conductors shall be single Lynx per phase, double circuit line.

Irakkandy- Kumburupitiya 33 kV

85. 33 kV tower line from Irankandy gantry to Kumburupitiya gantry (6.5 km)

86. The 6.5 km, 33 kV tower line from Irakkandy to Kumburupitiya gantry is passing through paddy fields and degraded lands (95%) and secondary forest area (5%). The line is close to a

village (Vallipunam), about 50 m to the nearst house but not going through any home gardens. The Irakkandy gantry location is about 630 m from the east coast and the Kumburuppidy gantry is about 175 m from the coastline. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The line has approximately 26 lattice towers and the conductors shall be single Lynx per phase, double circuit line.

Choisy-Thawalantenna 33 kV

87. 33 kV tower line from Choisy gantry to Thawalamtenna gantry (5 km)

Kegalle GS - Gevilipitiya 33 kV

88. 33 kV tower line from Kegalle (Molagoda) GS to Gevilipitiya gantry (11 km)

89. The 11 km, 33 kV tower line from Kegalle (Molagoda) to Gevilipitiya gantry traveres paddy fields (40%), home egardens (18%), rubber lands (16%) and some degraded lands (26%). The line is going through many home gardens, and therefore a number of home garden tree species and rubber trees (736) has to be cut down. Temporary impacts are foreseen on loss of crops during construction and loss of trees is anticipated. It crosses roads in four places and high tension line in one place and passes through villages such as Galpola, Wekaladeniya, Attanagoda, Panagamuwa, Polwatta, Uduwawala, Pattagama, Wewala, Lambutuwa, Bulugammana, and Gevilipitiya. See Annex 4, Table 4.4 & Table 4.12

CEB Distribution Division DD3

Badulla GS - Ella 33 kV

90. 33 kV tower line from Badulla GS to Ella gantry (16 km)

91. The 16 km, 33 kV tower line from Badulla GS to Ella passess through paddy lands (20%), home gardens (25%), tea estates 30%), degraded lands (23%), plantations (2%).

33 kV Ella Gantry

92. The Ella gantry will be located in a tea estate. Gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 03 nos. outgoing lines. At the gantry, incoming lines shall be with load break switches and the outgoing lines shall be with auto-reclosures.

Mahiyangana GS - Bibile 33 kV

93. 33 kV tower line from Mahiyanganaya GS to Bibile gantry (30 km)

94. The 30 km 33 kV tower line from Mahiyangana to Bibile gantry passes through paddy lands (55%), home gardens (29%), forest plantations (4%) and degraded area (9%) and dry zone tanks (2.5%). It crosses edge of Dambarawa tank close to the Mahiyanganaya GS and passes through several canals of Mahaweli system and crosses several roads and villages. Home gardens are affected in some areas, line passes through rubber estates close to Bibile town. Temporary impacts are foreseen on loss of crops during construction and loss of trees

(256) is anticipated. See Annex 4, Table 4.5 & Table 4.13.

Ratnapura GS - Idangoda 33 kV

95. 33 kV tower line from Ratnapura GS to Idangoda gantry (19 km)

96. The Google map shows that the line passes mainly through paddy fields (32.7%), home gardens (29%), rubber plantations (6%), and abandoned/ degraded lands (32%).

Monaragala GS - Wellawaya 33 kV

97. 33 kV tower line from Monaragala GS to Wellawaya gantry (34 km)

98. The 34 km, 33 kV tower line from Monaragala GS to Wellawaya gantry traverses paddy lands (36%), home gardens (34%), degraded lands (21%), and mixed plantations (9%) established by the Forest Department. No major environmental issues identified, the line is going through teak plantations, degraded forest areas close to Monaragala town, mixed plantations of the Forest Department near Wellawaya. Temporary impacts are foreseen on loss of crops during construction and loss of trees (473) is anticipated. see Annex 4, Table 4.6 & Table 4.14

CEB Distribution Division DD4

Morawaka Warukandeniya 33 kV

99. 33 kV tower line from Morawaka gantry to Warukandeniya gantry (18 km)

100. The 18 km, 33 kV tower line from Morawaka to Warukandeniya gantry traverses paddy lands (32%), home gardens (41%), degraded lands (22%), and secondary sparse forest (5.8%). Line is not going through any natural lowland rain forests in the area, mainly through paddy fields, tea plantations and home gardens. It crosses Morawaka-Neluwa road five times and deviate from the road after AP11, towards Warukandeniya. The line is going through many home gardens, and therefore a number of home garden tree species (119) has to be cut down. Temporary impacts are foreseen on loss of crops during construction and loss of trees is anticipated. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The line has approximately 35 angle towers and 36 suspension lattice towers and the conductors shall be single Lynx per phase, double circuit line.

Elpitiya to Mattaka 33 kV

101. 33 kV tower line from Elpitiya 11th Mile Post to Mattaka gantry (11 km)

102. The 11 km, 33 kV tower line from Elpitiya to Mattaka gantry traverses paddy lands (46%), home gardens (36%), degraded lands (12.5%), and tea & cocnut lands (6%). The line is going through many home gardens, and therefore a number of home garden tree species (152) has to be cut down. Temporary impacts are foreseen on loss of crops during construction and loss of trees is anticipated. No wildlife sanctuary, national parks or ecologically sensitive areas

are present in the nearby area of ROW. The line has approximately 29 angle towers and 15 suspension lattice towers and the conductors shall be single Lynx per phase, double circuit line. It crosses Avittawa-Elpitiya road, Elpitiya-Pitigala road, Kellapatha-Naranowita road and reaches Mattaka gantry land on Pitigala-Mapalagama road.

Matara GS to Yakabedda 33 kV

103. 33 kV tower line from Matara GS to Yakabedda gantry (18 km)

104. The 18 km, 33 kV tower line from Matara GS to Yakabedda gantry traverses paddy lands (62%), home gardens (11%), degraded lands (22 %), and tea & cocnut lands (2%). It crosses Kiralakele-Matara road, Godagama-Lenaduwa road, Watagedera road, Sri Rathanapala Mawatha, Matara-Akuressa main road, and Galle-Deniyaya main road. Temporary impacts are foreseen on loss of crops during construction and loss of trees is anticipated. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The line has approximately 30 angle towers and 42 suspension lattice towers and the conductors shall be single Lynx per phase, double circuit line.

- **Component 3: Rural electrification and distribution performance monitoring**

105. Under this component, 106 RE schemes including 198 km of MV lines and 393 km of LV lines are proposed to be implemented, as summarized in theTable 11. The project includes LV line extensions as given in the Table 12. There will around 35,700 benefited consumers of RE schemes and extensions among which, the majority (99%) would be household consumers.

Table 11: Proposed RE Schemes in each CEB Distribution Division

CEB Distribution Division	No. of Schemes	Line Length MV (km)	Line Length LV (km)	Number of Benefited Consumers
1	19	47	113	1,650
2	61	83	182	3,228
3	24	65	91	795
4	2	3	7	32
Total	**106**	**198**	**393**	**5,705**

Table 12: Proposed LV Extensions

Distribution Division	LV (km)	Number of Benefited Consumers
DD1	1,073	13,384
DD2	732	10,609
DD3	54	1,093
DD4	120	4,916
Total	**1,979**	**30,005**

- **Component 4: Reactive Power Management in the Transmission System**

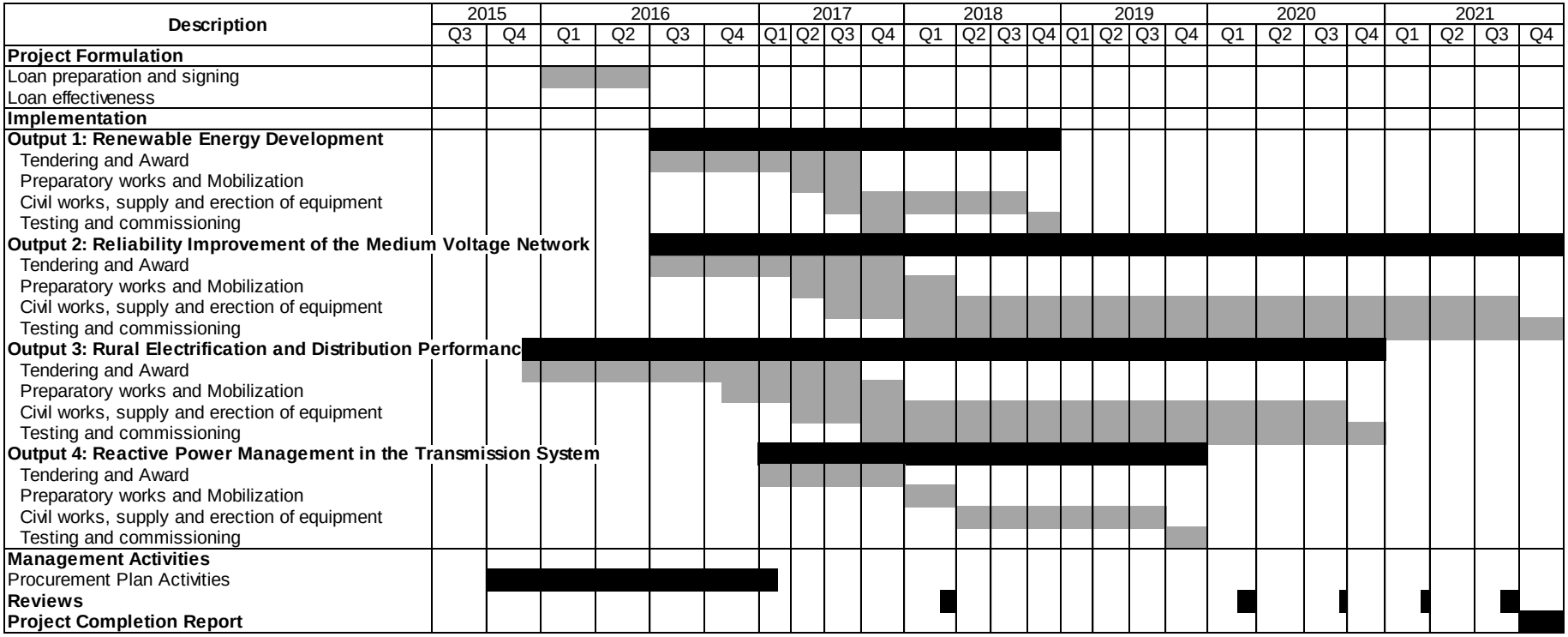
106. To improve the provision of reactive power closer to the load centers in the Western Province, and to improve reliability of the transmission system in the event of disturbances in the transmission system, respectively, CEB proposes the following:

  - Installation of 100 Mvar breaker-switched capacitors (BSC) at the 132 kV bus bar of the existing Pannipitiya GS (including a new 132 kV BSC bay), to control the voltage of the 220 kV bus bar
  - Installation of a +100/-50 Mvar static var compensator (SVC) at the 220 kV bus bar of the existing Biyagama GS (including a new 220 kV SVC bay), to control the voltage of the 220 kV bus bar during dynamic conditions

H. Implementation Plan

107. The total cost for implementation of all four components is USD 118.8 million. The proposed overall project implementation schedule is attached in Table 13.

Table 13: Overall Project Implementation Schedule



III. DESCRIPTION OF ENVIRONMENT (BASELINE DATA)

A. Jaffna District

108. The proposed hybrid renewable energy systems in Analaitivu, Delft and Nainativu Islands are located within Jaffna district of the Northern Province.

- **Physical Resources**

- **Topography, Geology and Soil**

109. Jaffna District is the northern end of the Northern Province of Sri Lanka, about 410 km away from Colombo. It consists of the peninsula and seven inhabited Islands. North, East and west boundaries of the district are the Indian Ocean, South is Jaffna Lagoon and Kilinochchi District. The total land area including inland waters is 1,012 km^2. Jaffna District is divided into four sub divisions: Islands, Valikamam, Thenmaradchi and Vadamaradchi. The Soil and Water Resource of the Jaffna Peninsula are both related to the limestone geology of the land. The soils are forme on the marine deposits and sediments under the influence of sea waves and winds on limestone. The limestone being a porous rock is the source of groundwater for the Peninsula. Well drained and high productive calcic Red Yellow latasol and Red Yellow latasol soil types are found in central areas (60,000 ha). Alkalin saline Soil and Regasol are found in coastal areas (26,000 ha) and Alluvial Soil is in Valukai Aru area (10,000 ha). In certain areas coral limestone is available. This different soil types offer scope for cultivation of exotic as well as local crops. The depth of soil varies from 90cm- 150cm.

- **Climate**

110. The climate of Jaffna is determined by the monsoon that forms a wet and dry season in the District. The major rainy season occurs during the North East monsoons from October to December and the minor rainy season occurs during the South West monsoon in April and May. The period between the South West Monsoon and the North East Monsoon is the dry season extending from June to September. The average rainfall is 1300mm but is highly variable, spanning a range of 630mm to 1780mm. The average temperature during the year fluctuated between 25 °C and 31 °C.

- **Water Resources**

111. Jaffna peninsula has a source of groundwater store in the Sub terrain layer of limestone. The limestone is the main aquifer. This aquifer has several isolated caves and caverns capable of storing ground water without evaporation losses. The entire groundwater is generated from percolated rainfall and it forms a freshwater lens beneath the peninsula. It is found that the fresh water lens do not extend below the base of the limestone. The fresh water lens is sustained by the buoyancy of fresh water in relation to seawater. Difference in density, (1.0, 0.25) giving a ratio of 40:1. That is every meter of fresh water above the sea level requires a depth of fresh water lens of 40m when no mixing between fresh and seawater takes place. There is no sharp interface between fresh and seawater.

- **Ecological Resources**

112. The military conflict has inflicted heavy damage to the vegetation cover of the district. Specially Palmyra and Palm trees have been extensively used as building material for bunkers, sheds, fences and have been cleared for minefields. In these areas, runoff may have increased. The following table shows, Forest Reserves (FR), Proposed Forest Reserves (PR) Sanctuaries (S) and National Park (NP) in Jaffna district.

Table 14: Reserves in Jaffna District

Name of Reserve	Status	Extent (ha)	District
Akkiriyan	FR	8179	JAF
Chunavil	FR	2298	JAF
Kilinochchi	FR	11191	JAF
Mandakalar	FR	8387	JAF
Nakapaduwan	FR	4149	JAF
Pallai	FR	461	JAF
Parititivu Island	S	97	JAF
Chundikulam	S	11149	JAF MUL
Iranaimadu	FR	8322	JAF MUL
Vaddakachchi	FR	7109	JAF VAV
Delft National Park	NP	1846	JAF

JAF- Jaffna, MUL- Mullativu, VAV- Vauniya

B. Trincomalee District

113. The proposed Kappalthurai gantry to 6th Mile Post gantry and Irakkandy gantry to Kumburupitiya gantry are located within Trincomalee district of the EasternProvince.

- **Physical Resources**

- **Topography, Geology and Soil**

114. Trincomalee District is located in the East of Sri Lanka in the Eastern Province. It has an area of 2,728 km^2. Inland waters cover 3.6% of the total area and the rest is the terrestrial land of the district. Trincomalee District is divided into 11 Divisional Secretary's Divisions (DS Divisions) and the largest is Kantalai. The DS Divisions are further sub-divided into 230 Grama Niladari Divisions (GN Divisions). Trincomalee District which is in the Northern part of the Eastern Province is bounded in the North by Yan Oya, and by Anuradhapura and Polonnaruwa Districts in the West and by Verugal Ganga in the South. Mainly 5 major soil groups found in Trincomalee District as Alluvial soils 35 %, Reddish Brown Earth 30%, Sandy Regosols 10 %, Erosion remnants 10 %, non classic brown alkaline saline and soil with gravel 15%. Considering the geomorphology in Trincomalee district, 5 main types are classified as; Hills and cliffs, Dunes, Estuaries, lagoons and Thona, Beach bars and spits, and Beaches/shorelines.

115. The sand found in the coastal area of district is very important due to its high Ilmenite mineral content which is found in very few other places around the world. Ilmenite contains titanium oxide. Titanium is an important component of light metal alloys used in the aircraft and space manufacturing industries. Pulmoddai heavy mineral beach sand deposits (monazite,

zircon) extend from the north of the District. The deposits consist largely of Ilmenite but also contain appreciable amounts of monazite, zircon and baddeleyite – a unique deposit by itself and exploited by the Ceylon Mineral Sands Corporation. The rocks at Kuchchaveli exhibit magnetic polarity due to the alignment of magnetite in the rock. Further south, charnockite at Tavikallu and quartz reefs at Mankanai also can be stated.

- **Climate**

116. According to Köppen climate classification, Trincomalee district features a tropical wet and dry climate. Annual average rainfall of the Trincomalee district varies within 1500-2000 mm. It features dry season from February to July and wet season for the remainder of the year. Trincomalee district receive rain during two short seasons. Usually northeast monsoon brings about 50% of the total rainfall and southwest monsoon only brings about 10% of the total rainfall. The principle causes for the low rainfall rate in the District can be given as, extensive plain morphology and the absence of a mountainous area within the District to intercept the north east monsoon. Average temperatures in Trincomalee district range from around 25 - 27.5°C. Average temperature is slightly higher in March – June period and temperature is slightly lower in November – January. The main reason for the relatively high temperature is the barrier to cooling westerly winds caused by the central mountains.

- **Ecological resources**

117. Total forest area in Trincomalee District is 1318 km^2. This total forest area includes brackish and saltwater forests, dry monsoon forest, mangroves, moist monsoon forest, riverine forest and sparse forest. Dry monsoon forest is the most common forest type in Trincomalee district and it occupies total area of 1087 km^2. Main service of this forest type is, it serves as habitat for wildlife. Sparse forests are the second most common type in Trincomalee district and total area of that is given as 145 km^2. The third most common type is forest plantations; it has total area of 68 km^2. Some forest areas are degraded due to the chena cultivation and these are at different stages of regeneration.

118. As a district located in the dry zone of the island, Trincomalee is home to a faunal composition representing the dry zone fauna of Sri Lanka. Most of the species of fauna common in this zone can be found in Trincomalee district too. This includes animals ranging from small insects to larger mammals such as the Asian Elephant. Protected area network within the district provides suitable habitats for these animals. The coastal habitats, shallow seas and the islands in the area are also highly ecologically important due to the presence of coral reefs and other shallow sea fauna including the rare and relict species like *Lingula*.

119. The oceans adjoining the district are very popular destinations for whales, dolphins and sea bird watching. Trincomalee district is known to support the existence of 38 nationally threatened vertebrates as of 2012. These vertebrates includes 2 freshwater fish species, 2 amphibian species, 2 reptile species, 26 bird species and 6 mammal species. However, the faunal composition of these areas is largely under studied. Several species of reptiles and dragonflies, which have been recorded from Trincomalee district in the past, are currently considered data deficient, as no or very few subsequent records are available. The dragonfly

Hemianax ephippiger, the snake *Dendrelaphis oliveri* (Oliver's bronze back) and the two skinks *Nessia deraniyagalai* (Deraniyagala's snakeskink) and *Lygosoma singha* (Taylor's skink) are such species.

Table 15: Name, Category and the Extent of Forest Reserves in Trincomalee District

Name	Category	Extent (ha)
Chundankadu	FR	5690.3
Chundankadu	PR	8443.7
Great Sober Island	S	64.5
Kantalai	FR	37479.3
Little Sober Island	S	6.5
Mahaweli Ganga	PR	6475.0
Mahaweli Ganga North and South	FR	8642.1
Pankulam-Northern Block	PR	52355.9
Pigeon Island	S	4.7
Seruwila-Allai	S	15540.0
Trinconmalee Naval Headworks	S	18130.3
Vappiah-Verugal	FR	4344.7
Kinniya	PR	14.2

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

C. Puttlam District

120. The proposed 33 kV line from Puttalam GS to Keeriyankalliya gantry is located within Puttalam district of the Northwestern Province.

- **Physical Resources**

- **Geography**

121. Puttalam is a district situated in the west coast of Sri Lanka. 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 to 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.

- **Climate**

122. 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 decrease gradually towards the north of the district. Most of the rain occurs in the Northeast monsoosn season (October to January). The average daily temperature exceeds 27^o C.

- **Topography, Geology and Soil**

123. The coastal belt zone of the project area north of Mundel 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:

124. 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.

125. 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.

126. 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.

127. 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 and thus the contact is an unconfined.

128. Two kinds of soils are found in the district. The southern part contains brown colored gravel based soil while 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 Ipil plantation.

- **Geomorphology**

129. 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.

- **Biodiversity**

130. 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. Thus, 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 many migrant birds visit every year. The Annawilundawa tank sanctuary 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 northwestern semi-arid zone of the country some of the bird species, which are mainly found in the Indian avifauna zone of Sri Lanka, 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 Puttalama 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 has been recorded from the Puttalama district.

Table 16: Name, Category and the Extent of Forest Reserves in Puttalam District

Name	Status	Extent (ha)	Name	Status	Extent (ha)
Galkuliya	PR	4127.8	Weerakulicholai-Elavankulam	PR	29192.4
Ipolagama	PR	4203.7	Weherabendikele	PR	275.0
Manuwangama-Nariyagama	FR	244.2	Wilpattu Block 2	NP	7021.4
Nakele	PR	80.9	Wilpattu Block 5	NP	21484.8
Pomparippu	FR	7021.3	Wilpotha	PR	2547.5
Pyrendawa	PR	110.6	Aruakalu	OSF	2100.0
Pyrendawa	FR	360.4	Kalu Aru	OSF	600.0
Sellankandal	FR	4265.8	Chilaw Lake	OSF	300.0
Sellankandal	PR	4542.2	Puttalam Lagoon	OSF	400.0
Tonigala	PR	937.3	Kalu Aru	OSF	600.0
Unaliya	PR	1096.7	Chilaw Lake	OSF	300.0
Wanniyagama	PR	14417.8	Puttalam Lagoon	OSF	400.0

FR- Forest Reserve, PR- Proposed forest Reserve, NP-National Park, OSF- Other State Forest

D. Kurunegala District

131. The proposed 33 kV line from Maho GS to Ma-Eliya gantry, and Mallawapitiya GS to Rathmalgoda gantry are located within Kurunegala district of the Northwestern Province.

- **Physical Resources**

- **Geography**

132. Kurunegala district is situated in the North Western Provence. The extent is 4812.7 km^2. The boundaries are Anuradhapura district in north, Matale district in east, Gampaha and Kegalle in thesouth and Puttlam in the west. Its geographical coordinates are 7° 29' 12" North, 80° 21' 53" East. It is administered through 30 Divisional Secretariat Divisions and 1610 Grama Niladari Divisions. Total number of Villages is 4432 and 15 Electoral Divisions. It consists of 01 Municipal Council, 01 Urban Council and 18 Local Councils. It has 06 Educational Zones.

- **Geology and Soil**

133. There are three distinct physiographic units in the Kurunegala district, namely: The coastal and alluvial plains, the central peneplain and the hilly and mountain areas in the east.

- **The coastal and alluvial plains**

134. The coastal plains constitute the lowest physiographic unit and consists of a very small are a close to the south western boundary of the District. They are also of recent origin, mostly well to excessively drained. They have poor physical and chemical characteristics. Coconut does well on these infertile sands, being tolerant of the low fertility of the soils. These soils are unsuitable for irrigated agriculture. Alluvial plains are of variable drainage are available adjacent to rivers and streams plains etc.

- **The central peneplain**

135. The gently undulating peneplain, covering the area east of the coastal region, constitutes a large part of the Kurunegla district. The major soils in the unit are Reddish brown earth and Low Humic Gley soil of the dry and intermediate zones. The soil s in the central peneplains vary from dark reddish brown to dark brown, medium to heavily textured and are gravelly. The gravel particles have diameter s ranging from 0.5 - 1.5 cm, and generally the presence of gravel does not affect the root growth. The soils have e favorable infiltration rate s of 1-3 cm/hour. Their physical and chemical characteristics are suitable for improving fertility and are expected to respond well to fertilizers.

136. **The hilly and mountain areas in the east**: The hilly areas in the east and south east, where relief becomes more pronounced and elevations are higher, is the third physiographic unit. The soils in this unit are similar to those in the peneplains but are better drained. Upland crops can be grown in patches of land where slopes are flatter, but topographic limitations inhibit irrigation. In Deduru Oya basin, which lies in wet and intermediate zones, the soils are more leached arid therefore less fertile.

- **Climate & rainfall**

137. Kurunegala features a tropical rainforest climate under the Köppen climate classification. The city's climate is tropical and hot all throughout the year. The surrounding rocks play a major role in determining Kurunegala's weather since these rocks increase and retain the heat of the day. During the month of April, the temperature can rise up to about 35 °C. The only major change in the Kurunegala weather occurs during the monsoons from May to August and October to January, this is the time of year where heavy rains can be expected. While the city does experience a noticeably drier weather during January and February, it does not qualify as true dry seasons as average precipitation in both months are above 60 millimetres (2 in). In general, temperatures from late November to mid-February period are lower than the rest of the year. Middle rainfall of this District is 900 - 2200 ml. North East Monsoon and South West Mon soon are the main rainfall method in this district. South West Monsoon is the largest rainfall system.

- **Water resources**

138. Considering the Water System of the district, it covers by 04 River Basins, North by Kala Oya, Central by Mee Oya and Deduru Oya and South by Ma Oya Basins. We can find out many Major and Micro-irrigation projects under these Water basins such as Rajanganaya, Usgala, Siyambalangamuwa, Hakwatunaoya, Kimbulwanaoya, Bathalagoda, Magalla, Palukadawala, Atharagalla, Mediyawa, Wennoruwa and Ambakoawewa projects.

- **Forest reserves**

139. Table 17 shows Forest Reserves, Proposed Forest Reserves and Sanctuaries in Kurunegala district.

Table 17: Reserves in Kurunegala District

Name	Status	Extent (ha)	District	Name	Status	Extent (ha)	District
Angurukandayaya	PR	139.2	KUR	Manapaya	PR	314.0	KUR
Badagamuwa	FR	228.7	KUR	Maragalkanda	FR	117.1	KUR
Banhedawaka	PR	159.0	KUR	Mawattagama	PR	2152.9	KUR
Barigoda	PR	72.7	KUR	Meeambakanda	FR	124.6	KUR
Barigoda	FR	78.5	KUR	Minuwangeta	PR	746.2	KUR
Dambuwa	PR	1062.3	KUR	Mipitikanda	PR	235.9	KUR
Dampitiya	PR	97.1	KUR	Moragolla	FR	21.3	KUR
Dawatagolla	FR	43.2	KUR	Moturampatana	PR	319.3	KUR
Degadaturawa	PR	161.9	KUR	Mudungoda	PR	774.2	KUR
Dehelgamuwa	FR	58.0	KUR	Nagolla	FR	123.1	KUR
Dewalakanda	FR	112.5	KUR	Nakele Mukalana	FR	39.8	KUR
Digalla	FR	90.3	KUR	Nawagatta	PR	62.7	KUR
Dikkele Mukalana	FR	336.4	KUR	Nelawa	FR	48.0	KUR
Doluwakanda	PR	400.6	KUR	Nelligalkanda	FR	50.0	KUR
Dunkanda	PR	301.1	KUR	Nettipolagama	FR	1.0	KUR
Elawaka	PR	168.3	KUR	Neugalkanda	PR	376.0	KUR
Galgiriyakanda	PR	1182.5	KUR	Nikawekanda	PR	151.8	KUR
Galketiyagama	PR	40.5	KUR	Nugampola	PR	339.9	KUR
Getadivula	PR	581.5	KUR	Pallekele	FR	14513.8	KUR
Gonagama	PR	457.7	KUR	Pannagama	PR	165.9	KUR
Gorakadola	FR	191.9	KUR	Pannawa-Geppalawa	PR	316.5	KUR
Habilikanda	PR	180.9	KUR	Pansalhinna	PR	123.4	KUR
Henegedaralanda	PR	731.7	KUR	Panwewa	FR	241.7	KUR
Heraliyawala	PR	13.8	KUR	Paragaharuppe	FR	54.0	KUR
Iriminna	FR	25.8	KUR	Polgolla	FR	53.6	KUR
Kadawatkele	PR	283.3	KUR	Polkatukanda	FR	151.5	KUR
Kaduruwewa	PR	120.2	KUR	Potuwewa	PR	241.6	KUR
Kala Oya	PR	4949.7	KUR	Rambodagalla	PR	202.3	KUR
Kalugala	PR	3365.0	KUR	Sangappale	PR	4694.8	KUR
Kalugalkanda	PR	153.0	KUR	Sundapola	FR	306.9	KUR
Kankaniyamulla	FR	1108.0	KUR	Talagomuwa	FR	81.3	KUR
Kanugollayaya	PR	211.7	KUR	Timbiriwewa	PR	1274.0	KUR
Kendahena	FR	69.2	KUR	Udapolakanda	PR	63.9	KUR
Kendahena	PR	0.2	KUR	Waulkele	FR	20.7	KUR
Kimbulwan Oya	S	492.1	KUR	Welikumbura	FR	80.9	KUR
Kirindigolla	FR	171.0	KUR	Weuda Mukalana	FR	152.1	KUR
Kumbalpola	PR	102.8	KUR	Yakdessakanda	PR	1011.7	KUR
Likolawewa	FR	3462.2	KUR	Sawarangalawa	PR	6309.5	KUR PUT
Ma Eliya	FR	383.6	KUR				

- **Social and cultural Development**

Population and community

140. The population of the Kurunegala district by 2012 amounted to 1,610,299. On a community basis, Sinhalese accounts for 1,471,339 persons. Majority of Kurunegala District's residents belong to Sinhalese. Other ethnic minorities include the Sri Lankan Moors, Sri Lankan Tamils, Burghers and Malays. Residents from ethnic minorities live in all parts of the District. The following Table summarizes the population of Kurunegala according to different ethnicity:

Ethnicity	Population
Sinhalese	1471339
Sri Lanka Tamil	18763
Indian Tamil	3582
Sri Lanka Moor	113560
Burgher	711

141. Kurunegala forms part of the “coconut triangle”. According to the census of 2002 the land extent under coconuts in Kurunegala district was 133,570 ha and 95,651ha for small holdings and 37,919 ha for estate. Kurunegala district has 06 Educational Zones. There are 864 Schools and out of them 28 are National Schools. Total number of Teachers is 20,221 in this District. Historical background of the district shows special features other than any District. Kurunegala is the only District, which had four ancient Kingdoms in Sri Lanka. They are Panduwasnuwara, Kurunegala, Yapawwa and Dambadeniya Kingdoms. It is important to note that we had found much evidence about the powers of the rulers of these Kingdoms.

E. Kegalle District

142. The proposed 33 kV line from Kegalle GS to Gevilipitiya gantry is located within Kegalle district of the Sabaragamuwa Province.

- **Physical Resources**

143. Kegalle district is situated in between the central highlands and western southern plains. The height of the western region is 50 m above sea level while the eastern region exceeds 1,800 m. Geographycally, Kegalle district lies in the North of the equator in between the North Longitudes of 6.50” and 7.20” and between the East Latitudes of 80.10’ and 80.35’. Its boundaries are on the north by Kurunegala district, on the south by Rathnapura district, on the east by Kandy and Nuwara-Eliya districts and on the West by Gampaha and Colombo districts. The territory of Kegalle district comprises of 48 km from North to South and 32 km from East to West and marks of its extent as 1692.8 km^2.

- **Geology**

144. Khondalite group of metamorphosed sediments termed as meta-sediments and Chatnokites which are metamorphosed sediments, basic volcanic rocks or both, belong to the Highland series which occupy a broad belt running across the center of the island from southwest to northeast. The district Kegalle lies within this belt and hence the geological

formations belong to the Highland series. Both the Khondalite and the Charnokite groups occur in very close association with each other. Sri Lanka's best graphite mine is situated at Bogala of the Kegalle district.

- **Soil**

145. The dominant soil group found in the district is Red Yellow Podzolic soil. This soil is predominant in the wet zone of Sri Lanka and as well as in the southwest country, where the annual rainfall is over 2800 mm. The rainfall is the over-riding factor in the formation of Red Yellow Podzolic soil group. Weathered rocks of the Khondalite group of Metasediments and Charnokites act as the parent material for Red Yellow Podzolic soils in the District. Reddish Brown Latozolic soils appear in regions where rapid erosion takes place and where earlier formed soils are removed. A variety of soils belonging to Alluvial group are found mainly in the river valleys and flood plains. They are found in the lower elevations and are valuable agricultural soils. The minerals such as clay and gems are deposited in these alluvial soils. In many river valleys, gravel or pebble beds also can be seen all over the District.

- **Climate & rainfall**

146. The mean annual day temperature in the District is estimated to be between 26.5 °C and 28 °C. Diurnal range is around 6°c. Kegalle district geographically belongs to the North Eastern wet zone and it receives heavy rains as well as bright sunshine throughout the year. Rain usually falls during monsoons, conventional and cyclone periods and an extended rainfall pattern throughout the year can be seen in the district. The annual rainfall is 2500mm 3000mm. Further, as the district is situated in the wind face of the central hills, highest rainfall receives during the period of southwest monsoon which is from May to September. It is normally between 1500mm-2000mm.

- **Water resources**

147. More than 60% of the area of the district of Kegalle is drained by the Kelani Ganga system. Its headwater tributaries rise at elevations exceeding 5500' above sea level on the hill slopes forming the western rim of the Central Highlands of Sri Lanka. Another river which finds its origin in the district is the Attanagalu Oya. In most divisions of the Kegalle district, some groundwater sources are utilized for local domestic water supply. However, no extensive groundwater aquifers have been identified in the district. The water table varies from 10m to 30 m. During dry season, most of the wells run dry causing a shortage of drinking water in the division such a s Kegalle, Warakapola and Galigamuwa.

- **Biodiversity and Natural Resources**

Forest resources

148. The natural vegetation of the district as a whole can be described as evergreen tropical lowland rain forests. The characteristic trees in this type of forests belong to the family of *Dipterocarpaceae*. The other important genera are *Cullenia, Palaquium, Calophyllum, Mesua* and *Semecarpus*. The trees grow up to 30-40 m in height.The bigger trees are generally buttressed. The undergrowth is mostly made up of young trees. However, in the areas with a

higher elevation such as Deraniyagala and Yatiyantota, the lowland, rain forest gradually passes in a wide ecotone into the “lower montane rain forests”. Out of the total forest cover in the district, Deraniyagala division has 53.7%. This is the area, which receives the highest rainfall and has the highest attitude. The Deraniyagala forest cover comes under the peak wilderness of Sri Lanka.

149. There are four sanctuaries in Kegalle district. The bird sanctuary situated in the Kegalle DS division is locally known as “Kurulu Kele”. This bird sanctuary has an extent of 113.3 ha and declared as a sanctuary on 14th March 1941. Welhella-Katagilla sanctuary is situated in a hilly area.This was declared on 18th February 1949 and the extent was 134 ha. The major problem faced by the authorities in maintaining these sanctuaries are the encroachments and illicit felling.

Table 18: Reserves in Kegalle District

Name of forest Reserve	Status	Extent (ha)	District
Alapalawala	PR	182.1	KEG
Amanawala-Ampane	PR	518.0	KEG
Dambulla	FR	172.3	KEG
Debetgama Bossella	PR	103.2	KEG
Gangekumbura	FR	156.4	KEG
Kegalle	S	113.3	KEG
Kelani Valley	FR	1155.1	KEG
Kitulgala	PR	265.9	KEG
Maniyangama-Timbiripola	FR	209.0	KEG
Paspolakanda	PR	112.5	KEG
Welhella-Ketagille	S	134.2	KEG
Welhella-Ketangilla	FR	128.8	KEG
Kurulukele	S	0.0	KEG
Peak Wilderness	PR	5665.7	KEG NUW
Peak Wilderness	S	22379.2	KEG NUW RAT

KEG- Kegalla, NUW- Nuwara Eliya, Rat- Ratnapura, FR- Forest Reserve, PR- Proposed forest Reserve, S- Sanctuary

F. Ratnapura District

150. The proposed 33 kV line from Ratnapura GS to Idangoda gantry is located within Ratnapura district of the Sabaragamuwa Province.

- **Physical Resources**

Geography

151. Ratnapura district has an extent of 3,275.4 km^2 and the boundaries are Kegalle and Nuwara Eliya districts to the north, Galle, Matara and Hambantota districts to the south, Colombo and Kalutara districts to the west and Badulla and Monaragala districts to the east. Topography Ratnapura district is located to the southwest and south of the Central Highlands and lies between 6° 15' - 6°55'N latitude and 80° 10' - 80°57’E longitude. The general elevation of the district ranges from 30 m to 2,135 m. Mountain ranges, high peaks, dissected plateaus,

escarpments etc. cover a greater part of the district. From its height and slope characteristics, the district can be divided into three main morphological regions:

(a) The low lands including mainly the basins of the Kalu Ganga and the Walawe Ganga. On the basis of elevation, the lowlands may be further subdivided into two distinctive units: the first with an elevation up to 30 m and the second from 30 m to 270 m.
(b) The uplands with an elevation of 270 m to 1,060 m consist of a ridge and valley topography. Uplands are also characterized by highly dissected plateaus of the Sabaragamuwa ridges, the Rakwana hills and the Southern Platform of the Central Highlands.
(c) The highlands which lie at the elevation of over 1,060 m consist of plains and plateaus, mountain peaks and ridges, rock-knob plains, erosional remnants, steep rocklands and lithosols. These features characterize the highest elevations of the southern rim of the Central Highlands, Rakwana massif and the Southern platform. The southern rim of the Central Highlands extends along the northern part of the Ratnapura district is at elevations ranging from about 1,250 m to over 2,000 m.

- **Geology and Soil**

152. Geologically, Ratnapura district is made up of the Highland series of rocks belonging to the Precambrian age. It is also evident from the Geological Map of Sri Lanka that approximately two-thirds 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 charnockitic gneisses extend along the southern rim of the Central Highlands and have been concentrated in the northwest of the district. In addition, patches of marble can be seen in the Pelmadulla-Godakawela area, in the area lying between Weragoda and Gongala, as well as between Colombage Ara and Timbolketiya. The slopes and the drainage system have largely been governed by its geological structure. 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 about 280 m^3 /s. Its basin has an area of 2,720 km. The annual run-off is 6.3 million acre ft. Across its basin the Kalu Ganga receives a high rainfall averaging between 3,000 mm and 5,000 mm annually. The river itself rises in the Central Highlands and flows in a westerly direction to reach the sea at Kalutara. The upper reaches of the river and its tributaries are confined to relatively narrow valleys with steep slopes. Further downstream the valleys become wider and flatter, while in the lower reaches, the river is enclosed by levees and raised above the level of the immediate flood plain. The Walawe Ganga lies to the east of the Kalu Ganga basin and is separated 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. Many of the lateral tributaries of the Walawe Ganga in its western flank rise in the Rakwana massif, the Southern Platform and eastern part of the southern rim of Central Highlands. These tributaries have carved out deep valleys influenced as they are by the regional geological structure.

153. Distribution of soils in the Ratnapura district has close affinity with topography, geology and climate. The highest elevations of the southern rim of the Central Highlands, Rakwana massif and Southern platform are formed by erosional remnants, rock knob plains and steep rock land and lithosols. 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.

- **Climate & rainfall**

154. The average annual rainfall in the Ratnapura District is around 3,800 mm, but varies from 1,250 mm in the southern extremities to over 5,000 mm in the northern parts of the district. The average annual temperature of the district varies between 26.9°C and 27.8°C, but seasonal and diurnal range of temperature is more marked.

Ecological Resources

155. Two main vegetation types occur in the Ratnapura district are, tropical lowland rain forest and the submontane/ montane forest. The Sinharaja forest belongs to tropical rain forest type. There are also the smaller reservations at Waratelgoda, Delgoda, Delwala, Kuduminiya, Damalakandd and Welankanda which show characteristics somewhat similar to Sinharaja.

The following table shows the Forest Reserves (FR), Proposed Forest Reserves (PR) and Other State Forest (OSF) in Ratnapura district.

Table 19: Reserves in Ratnapura District

Name	Status	Extent (ha)	Name	Status	Extent (ha)
Ayagama	PR	214.3	Tibbutukanda	PR	233.9
Bambarabotuwa	FR	5440.3	Ulinduwewa	FR	104.7
Dambuluwana	FR	401.1	Talagahakanda	FR	60.4
Delgoda	PR	998.0	Tandikele	PR	290.2
Delwela	PR	1560.1	Tibbutukanda	PR	233.9
Demanagammana	PR	114.1	Ulinduwewa	FR	104.7
Etabedda	FR	70.8	Walankanda	FR	711.5
Gilimale-Eratne	PR	4838.8	Walawe Basin	FR	3229.7
Helapandeniya	PR	21.4	Waratalgoda	PR	1889.9
Hidellana-Weralupe	PR	128.1	Wewelkandura	PR	429.0
Hidellana	FR	48.6	Masimbula	PR	255.0
Iriyagahahena	PR	44.5	Sinharaja	PR	2772.1
Iriyagahahena Mukalana	FR	44.1	Sinharaja	FR	2428.1
Kumburugamuwa	FR	1480.7	Boranjamuwa	OSF	70.8
Karandana	FR	77.8	Angamana	OSF	175.0
Karawita	PR	1211.8	Asantanakanda	OSF	800.0
Kobahadunkanda	PR	890.3	Dotalugala	OSF	175.0
Kudumiriya	PR	2144.8	Appalagala	OSF	200.0
Madampe	PR	40.5	Kudagoda	OSF	650.0
Madampe	FR	224.8	Talawegoda	OSF	450.0
Magurugoda	FR	241.0	Mulgama	OSF	200.0
Magurugoda	PR	24.7	Galleletota	OSF	325.0
Masimbula	FR	20.2	Kuragala	OSF	325.0
Marakele	PR	106.2	Hapugala	OSF	600.0
Marakele	FR	76.9	Narangattahinna	OSF	250.0
Messana	PR	433.8	Gallegodahinna	OSF	200.0
Morahela	FR	846.9	Hataramune	OSF	200.0
Mudunkotuwa	PR	78.1	Galbokaya	OSF	175.0
Muwagankanda	FR	132.1	Kabarakalapatana	OSF	675.0
Nahiti Mukalana	FR	195.7	Digandala	OSF	100.0
Pallepattu	FR	657.9	Handuwelkanda	OSF	150.0

Pannala	FR	129.0	Gorangala	OSF	400.0
Rajawaka	PR	2387.6	Handapan Ella	OSF	3600.0
Rammalakanda	PR	453.7	Gongala	OSF	1600.0
Ranwala	PR	867.5	Paragala	OSF	900.0
Rathkarawwa	PR	4021.4	Dumbara	OSF	100.0
Talagahakanda	FR	60.4	Alutwelawisahena	OSF	800.0
Tandikele	PR	290.2	Kiribatgala	OSF	300.0

Natural resources

156. As two major groups of natural resources, inorganic and organic resources can be identified in the Ratnapura district. The existence of mineral (inorganic) resources in the district shows an affinity to rock types, weathering conditions and pattern of deposition. The mineral resources of the Ratnapura district include a variety of gemstones, clay deposits, crystalline limestone, charnockitic gneisses and basic rocks - used as building materials. Gemstones are the most widespread resource in all DS divisions. As a result of over exploitation, gemstones may nearly be exhausted in the DS divisions of Kalawana, Imbulpe, Ayagama, Pelmadulla, Ratnapura and Balangoda. Gemstone is a potential resource in many DS divisions. The gem-bearing sediments are rich in rare-earth elements like V (vanadium), Cr (chromium), Mn (manganese), Zn (zinc), Zr (zirconium), Ba (barium), Ce (cerium) and Sr. (strontium). Furthermore, element pairs Zr-Hf (Zirconium-hafnium), Zr-Ce (Zirconium-Cerium) and Zr-Ti (zirconium- titanium) show good correlations with each other.

157. Quartzite, mica, graphite, clay deposits and iron ore (limonite) are the other minerals, found in some abundance in the Ratnapura district. The presence of iron ore (mainly limonite deposits) is noticed in Eheliyagoda, Kalawana, Nivitigala, Pelmadulla and Balangoda AGA divisions. Small parts of gold dust have been found in the alluvium and gravels of several rivers, Walawe Ganga and its tributaries for example, in the Katugasella Oya, the We Ganga and the Weralupe Dola. Main organic or living resources in the district are found in forest resources and wildlife.

G. Galle District

158. The proposed 33 kV line from Elpitiya to Mattaka gantry is located within Galle district of the Southern Province.

- **Geography and physical resources**

159. Galle district which is called as Capital of the Southern Province, bounded on the north by Kalutara and Rathnapura districts, on the east by Matara district and on the west by Indian ocean and is extended within an area about 1651.6 km^2 and the area of about 16 km^2 is covered by inland water bodies. Galle district lies between 5.97- 6.44 of northern latitudes and between 79.99 - 80.49 of eastern longitudes.

160. The topography of Galle District is very much dissent. The general elevation of the Galle district ranges from mean sea level to 700 m, and forming different landforms and drainage patterns. The landforms and drainage patterns have close relationship with local geological

structure. Four terrain types can be identified: flat, flat to undulating, rolling and hills, and steeply dissected rolling and hills.

161. Galle district is administered through 19 Divisional Secretariat Divisions. There are 896 Grama Niladhari divisions and 2446 villages. There is 1 Municipal Council, 2 Urban Councils and 17 Pradeshiya sabha are established in Galle district.

- **Physical Resources**

162. Charnockites and charnockitic gneiss rocks cover 30 % of the Galle district and rest includes the Quaternary and recent deposits. All these geologic formations have also a basic relationship with terrains, drainage patterns and soil drainage as well as the mineral resources. Six types of rocks are evident in the Galle district. Of these, charnockites (hypersthene, diopside gneiss or granulite bearing hornblende, biotite, and garnet) and charnokitic gneiss cover by 2/3 of the district. The rest includes undifferentiated Highland Series rocks (Garnet-sllimanite-biotite gneiss, garnet biotite gneiss etc.), dolomatic rocks, garnet-biotite gneiss, Quaternary deposits (alluvial and lagoonal deposits, clay, silt and sand) and granite (intrusive rocks).

163. Six main soil groups are found in the Galle district: Red-Yellow Podzolic Soils; steeply dissected hill and rolling terrain, Red-Yellow Podzolic Soils, soft or hard laterite; rolling and undulating terrain, Red-Yellow Podzolic Soils, semi-prominent Al horizon; hilly and rolling terrain, Alluvial soils of variable drainage and texture; flat terrain, Bog and half-bog soils; flat terrain and Regosols on recent beach sand; flat terrain.

- **Climate & rainfall**

164. Even though the Galle District belongs to the South-West area of Sri Lanka, it belongs to the wet zone in low country in accordance with the land inconsistencies and rainfall. Annual rainfall is between 2000–2500mm. Average Annual Temperature is 75˚ F.A. Heavy rainfall is received by the South-East Monsoon rain during May to September in the year. Convectional rains together with cyclones contribute rainfall in addition to this.

- **Water resources**

165. Bentota Ganga, Gin Ganga and the upper part of the Polwatumodara Ganga (rest belongs to Matara district) are the main source of surface water draining from the Rakwana Hills. Catchment areas of both Bentota and Gin Gangas extend far beyond the district boundary. Madu River and Koggala stream are existed apart from this. Madu Ganga, Madampe Lake, Telwatta Ganga and Koggala Lake have long and narrow outlets to the sea, with terrestrial water from the inland, and their salinity is very low. The main source of groundwater recharge is rainfall. According to the average annual run-off of 94,805m^3 and average annual rainfall, the availability of average groundwater rate is considerably high.

- **Major Ecological Features**

166. Lowland rain forest is the major ecological feature that is found in the Galle district. Although much of the original extent of the rain forest areas has been reduced, 18,910 acres of

this rain forest existing in the Galle district covering about 11% of its land area. Tropical Lowland rain forests are commonly found at elevations below 1000 m above msl. These forests receive an annual rainfall of 2500-5000 mm, free of long dry spells, and are evergreen with no significant seasonal changes. A clear stratification can be observed in these forests. There is a continuous canopy at approximately 30 m above ground level with a few specific trees emerging above the canopy layer. Beneath this layer is an interrupted sub-canopy at around 15 m. A fourth layer of shrubs is located beneath the sub-canopy. Herbaceous plants, ferns and a whole range of seedlings comprise the ground layer. Many plant communities are found here such as the Dipterocarpus community (*Dipterocarpus zeylanicus* and *Dipterocarpus hispidus*), Mesua-Doona community, and Vitex-DilleniaAnisophyllea community.

- **Natural vegetation**

167. Types of vegetation in the district are Low Evergreen Tropical Rain Forest, Swamp vegetation, Mangroves, and Littoral vegetation. The low evergreen tropical forest extends from low hills and rises to upland areas. The reserved and proposed reserved forests are included in this type. The 'Sinharaja' forest which in the boundary of Galle district is recognized as a World Heritage Site. Kanneliya Forest Reserve located in the Galle district is the largest of the KDN, or Kanneliya-Dediyagala-Nakiyadeniya, forest complex.

168. Small patches of grasslands can be seen on rolling terrain and hills, as well as steeply dissected rolling and hilly areas. Mangroves occur mainly along the coastal zone in close proximity to the mouths of rivers and lagoons. Due to inundation of tidal water, mangroves form strips and patches in the brackish lakes and marshes.

- **Biodiversity**

169. A total of 547 faunal species belonging to 132 families were recorded within the Galle district during the survey period. There were 147 endemic and 89 nationally threatened species among them. When considering the proportional representation, birds were the most abundant vertebrate group whereas freshwater crabs were the least abundant taxonomic groups.

170. **Freshwater Fish:** Total of 64 species of freshwater fishes belonging to 24 families can be seen in the aquatic habitats of Galle district. These habitats include natural and manmade systems. Of the total species recorded, 59 are indigenous and 4 are exotic while 15 of indigenous species listed as threatened (IUCN Sri Lanka, 2007).The number of indigenous species is approximately 75 % of the island's indigenous freshwater fish fauna. This is a significant proportion when considering the current forest cover in the Galle district. The majority of the fish fauna recoded in the stream habitats inside the rainforests and some are recorded in the marshy habitats. A total of 24 endemic fish species were recorded from the Galle district. Sinhala Barb (Puntius sinhala) & Striped Rasbora (Rasbora deniconius) are the most widely distributed fish species in the Galle district. Critically endangered Barred Danio (Devario pathirana) is recorded only from Kanneliya Forest Reserve. Exotic species such as Tilapiya (Oreochromis mossambicus), and Gappy (Gambusia affinis) are recorded in several locations in Galle district.

171. **Amphibians**: 33 species of amphibians belonging to 4 families are recorded from the Galle district. They represent about 30 % of the island's amphibian fauna and consist of 24 endemic species and 13 nationally threatened species (IUCN Sri Lanka, 2007).

172. **Reptiles**: 58 species of reptiles belonging to 14 families were recorded from the Galle district, which included 23 endemic and 12 nationally threatened species (IUCN Sri Lanka, 2007). One of Sri Lanka's largest reptiles, the Mugger Crocodile (Crocodylus palustris) and Python (Python molurus) are also recorded from natural habitats of Galle district.

173. **Birds:** Total of 149 species of birds belonging to 43 families are recorded, which included 18 endemic and 13 nationally threatened species. There are 10 species of migratory winter visitors. Lowland wet zone forests are home for many endemic species of birds. Record of critically endangered Blue Eared Kingfisher (Alcedo meninting) from Kottawa-Kombala (Hiyare) is very significant since there are very few records of this bird from Sri Lanka. Endemic Black Crested Bulbul (Pycnonotus melanicterus) is the most widespread bird species that was encountered in all the sampling sites.

174. **Mammals**: 35 species of mammals belonging to 22 families are recorded from the natural habitats. This included 6 endemic and 10 threatened species (IUCN Sri Lanka, 2007). Among the threatened species, endangered Hog Deer (Axis porcinus) recorded from several locations in Elpitiya area. Threatened species of Loris (Loris tardigradus) and Golden Palm Civet (Paradoxurus zeylonensis) can also be seen. Vulnerable Purple Faced Leaf Monkey (Semnopithecus vetulus) and Giant squirrel (Ratufa macroura) are common in the outskirts of the wet zone forest habitats. False Vampire Bat (Megaderma lyra) and Long-eared Vampire Bat (Megaderma spasma) bat species are present in the rock caves in the rain forests of Kanneliya.

175. **Butterflies**: There are 7 endemic and 17 nationally threatened species among them (IUCN Sri Lanka, 2007). Documentation of Ormiston's Oakblue (Arhopala ormistoni) from Kanneliya was very significant as it is the first record since 1917. Critically endangered Ceylon Banded Awl (Hasora badra) butterfly species is recorded at Kanneliya and Rumassala it is a range extension of its distribution. Rare Brown Onyx (Horaga albimacula) and endangered Southern Duffer (Discophora lepida) are also recorded from Kanneliya & Kottawa-Kombala forests respectively. Endangered Silver Streak Blue (Iraota timoleon) and a newly recorded Orange Migrant (Catopsilia scylla) can be seen in Rumassala area. White four-ring (Ypthima ceylonica), Gladeye Bushbrown (Nissanga patina), Glassy Tiger (Parantica agiea) and Common Crow (Euploea core) are the most commonly encountered species.

176. **Dragonflies**: Out of 62 species recorded, 54 of them found in Kottawa-Kombala (Hiyare) forest Reserve. There were 18 endemic and 2 nationally threatened species among them (IUCN Sri Lanka, 2007). Land snails: 33 species of land snails belonging to 7 families were recorded, which included 20 endemic and 6 nationally threatened species (IUCN Sri Lanka, 2007). Newly described and critically endangered Ratnadvipia karu is recorded in the forest habitats. Acavus haemastoma is the most common land snail species that was encountered in most of the sampling locations. Freshwater Crabs: 7 species of freshwater crabs are recorded from the Galle district, which included 7 endemic and 1 nationally threatened species (IUCN Sri Lanka, 2007). Ceylonthelphusa kandambyi is common species in many forest habitatsof the District.

- **Social and Cultural Development**

Population and community

177. According to the National Census Report 2012, population of Galle district is 1,058,771. Majority of Galle District's residents belong to Sinhalese. 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 gives the summary of the population of Galle district according to different ethnicity:

Ethnicity	Population (2012)
Sinhala	998,540
Sri Lankan Tamil	15,228
Indian Tamil	5,641
Sri Lankan Moor	38,591

178. Most of the Population in Galle District such as 1,063,334 is living in the rural sector. This is a percentage of 85.68%. Woman Population is prevailing at a higher level and this is 52% as a fraction.

Economy

179. Galle district is contributing a considerable income into the national income through Agro based industries and tourism industries. Paddy, Tea, Rubber, Coconut and Cinnamon are considered as main crops, while Bentota, Unawatuna, Hikkaduwa and Koggala areas along the coastal belt considered as vastly famous in Tourism industry.

180. Free Trade Zone – Koggala is located 10 kms away from Galle City and more employments have been created under this project. Wood Carving industry such as Beeralu and Reynda (Carving Elephants), Masks and Puppets are also inherited industries among the other traditional creations. The contribution to the overall National Economic Development of the country has been increased due to the impact of the Galle-Colombo High Way. This has also been a back force for the Tourism sector and the activities of Galle Harbor.

Health & Education

181. There are 30 health facilities such as hospitals and meducal centres in Galle district. Under-5 underweight percentage in Galle district is 35.6%.There are 449 of primary and secondary schools in the district.

Sites of Cultural, Archaeological and Historical Significance

182. Rumassala Hillock evidencing “Rama - Ravana” era, Spreading glory throughout the entire area and shining Fortress of Galle and Fort of Galle which, symbolizes colonial era of Sri Lanka. Unwatuna Welle Devala & Seenigama sacred areas considered as living lands of God

Devol, while Yatagala & Paragoda Sacred Areas of Buddhist Temples where all those are considered as historically very important places which, situated in Galle District.

183. Galle District has been important from historical perspective. Also in literary perspective as well when considering the historical books such as Mayura, Thisara, Paravi and kokila Sandeshayas as these contained the details and extreme appreciations on Galle City and those literary creations were written in the Kotte kingdom which is also considered as the golden period of the Sri Lankan literature. The natural harbor attached to this is famous among the foreigners since long period. The Dutch had also enlarged Galle fortress after their invasion of the Galle City. There are also other special places in the District: Dutch Fortress and Fort, Rumassala Mountain, Sinharaja Forest and Duwili Ella, small islands around the Madhu River, Madol Duwa and Martin Wickramasingha Museum, Seenigama and religious land of Welle Dewalaya and Galle Light house together with Oceanic Museum.

H. Ampara District

184. The proposed 33 kV line from Ampara GS to Uhana gantry is located within Ampara district of the Eastern Province.

- **Geography and physical resources**

185. Ampara District is located in the south east of Sri Lanka in the Eastern Province. It has an area of 4,415 km^2. In total, the district accounts for 6.76% of the country's land area. It is located at an elevation of 130 meters above sea level and its population amounts to 614,674. Its coordinates are 7°4'60" N and 81°45'0" E. It has 20 divisional secretariats and 503 Grama Niladhary Divisions, Kalmunai and Akkaraipattu Municipal Council and Ampara Urban council.

186. The dominant soils in the area are Reddish Brown Earths (RBE) and Low Humic Gley on undulating terrain, Non-Calcic Brown (NCB) soils on old alluvium & Solonets on undulating terrain, Alluvial soils of variable drainage and texture on flat terrain and Regosols on recent beach and sand dunes. The other dominant soil group is Non Calcic Brown soils which are coarse textured and generally associated with the middle and upper terraces of prior river systems. They also occur in a complex pattern with other soils of irregular and complex landscapes. Thus, their relationship to the landscape is more complex than that of the RBE, which shows a very clear centenary relationship with the landscape. However, within a single valley, their texture varies according to its physiographic position. The composition and mineralogy of the alluvial soils, especially in secondary valleys, are greatly influenced by the kind of dominant soils and parent materials in the catchments.

- **Climate & rainfall**

187. The mean annual temperature of the district is 28°C. The rain fall is not equally distributed throughout the year and has a bimodal pattern having heavy intensity in the months of October to March (Maha Season) with less shower rains in April to September (Yala season) The annual average rainfall varies from 900 mm to 1150 mm. The North East Monsoon brings major part of the rainfall with little variation within the district.

- **Water resources**

188. Ampara District based on the Gal Oya Project and Mahaweli C Zone for the irrigation is very suitable for the paddy cultivation. In the district, a few man-made reservoirs are found: Chadayanthalawa Tank, Borapolla Tank, Thalapitiya Oya Anicut, Kanchikudichcharu Tank, Rufus Kulam, Vammiyadi Kulam, Naulla Tank, Semmani Kulam, Segamam Tank and Thonical Anicut.

- **Biodiversity and Natural Resources**

189. Ampara district consists of many forest areas. It is resourceful area for the wildlife and wild animals. Gal Oya National park, Ampara Sanctuary, Lahugala national forest and Buddangala sanctuary are sanctuaries in the district.

190. **Gal Oya National Park**: This was established in 1954 and serves as the main catchment area for Senanayake Samudraya, the largest reservoir in Sri Lanka. An important feature of the Gal Oya National Park is its elephant herd that can be seen throughout the year. The vegetation of the forest is of three types: forest, shrub and grassland. The national park contains a substantial area of savannah grasslands known as thalawa in Sinhalese and mountainous grasslands known as pathana. Thalawa grassland is dominated by rough grass species, *Cymbopogon nardus* ("mana") and *Imperata cylindrica* ("iluk"). Rare plants of medicinal value such as *Pterocarpus marsupium*, *Careya arborea*, and *Cassia fistula* are also found in the forest. *Berrya cordifolia*, *Mangifera zeylanica*, *Diospyros* spp., Ziziphus spp. and *Mallotus repandus* ("wal keppetiya") are the common flora species. Thirty-two terrestrial mammal species have been recorded in the park. More than 150 species of birds have been recorded in Gal Oya.

191. **Lahugala National Park**: This national park is traditionally used by elephants as a feeding ground. A herd of 150 individuals is attracted by *Sacciolepis interrupta* grass which is common around the Lahugala tank. Many wetland birds are found in Lahugala Kitulana. *Melanochelys trijuga* and *Lissemys punctata* are two freshwater turtles that inhabit in the tank of Lahugala. Endemic fish species *Clarias brachysoma* is also dwell in the tank.

- **Social and Cultural Development**

Population and community

192. Ampara District's population was 648,057 in 2012.The district is one of the most diverse in Sri Lanka, both ethnically and religiously. The population of the district like the rest of the east and north was affected by the civil war. The war also caused many people from all ethnic and religious groups who lived in the district to flee to other parts of Sri Lanka, though most of them have returned to the district since the end of the civil war.

Ethnicity	Population(2012)	%
Sri Lankan Moor	282,484	43.59%
Sinhalese	251,018	38.73%
Sri Lankan Tamil	112,750	17.40%
Indian Tamil	165	0.03%
Other	1640	0.25%

Religion	Population(2012)	%
Muslim	282,746	43.63%
Buddhist	250,213	38.61%
Hindu	102,454	15.81%
Christian	12,609	1.95%
Other	35	0.01%

Economy

193. According to the 2012 census, the percentages of economically active population in Ampara district are 77.8% and 22.2% male and female, respectively. The main livelihood of the district is paddy cultivation. The district lies entirely in the dry zone and two growing seasons are cultivated with the help of irrigation facilities. The total cultivable area under paddy is 55,000 hectares and the average seasonal production is 250,000 metric tones, 20% of the country's demand. Fishing (Inland & Marine) is the other important livelihood. Approximately 92,000 people from about 17,000 families are involved in fishing. Nearly 10,000 metric tones of fish are caught annually, 80% of which is transported out of the district. Finally, about 6,000 hectares of sugar cane is also cultivated to provide raw material for the sugar factory in the district. Small industries, including handloom industries, mat and bag weaving, rice milling, pottery, tobacco, needlework, confectionery and paper products are another source of income for the district.

Sites of Cultural, Archaeological and Historical Significance

194. Ampara district is a very valuable place related with history, religion and culture. Buddangala Bhikkus' Place, Rajagala Buddhist temple, Deegawapi Buddhist temple and Mangul Buddhist temple and Muhuthu Buddhist temple are some prominent archaeologically valuable Buddhist temples in the district. The Buddhangala area belonged to the Digamadulla Kingdom, which was started by Prince Dighayu in the 4th century BC.

195. Hot springs in the areas of Maha Oya and Padiyatalawae, beautiful beach in Arugambay area and the road for the devotees who make their pilgrimage to Kataragama are some pleasant places for tourists. There are still two three places like Pollepetta and Henanigala in the district for ancient community like Veddah (indigenous people). Ampara emerged as a settlement of Aryans during the monarchy of Bandugasdeva who ruled the country after Vijaya. When the Polonaruwa kingdom declined, its reign was pushed to the south western area and Ampara emerged as a forest reserve. When we travel around the areas of the Ampara District, we may witness several ruins related with irrigation development that had been developed for a long time. Galoya was the food land of Veddha society before the historical inscriptions of Sri Lanka was maintained. This is seen in the inscriptions up to the period of 3rd century A.D. established by the prehistoric Aryan society.

196. In terms of the inscription, it is proven that Sachchiriya Singha lived in Ampara during his ultimate period. The inscription says that the village referred to in the inscription was a self-sufficient village and things were not brought from the outer areas for the sale. The said inscription further refers to that the area was ruled by the kingdom of Anuradhapura. Historical evidence proves that Ampara was a prominent place during the Polonnaruwa regime.

Environmental Problems

197. The major environmental issues in Ampara district are, the tsunami contaminated wells and increased salinity, rendering water impure for drinking. Due to the Tsunami disaster on 26th December 2004, large extents of crop lands were affected by sea water intrusion. With the action of sea waves, the lands were physically damaged by removal of soil by erosion and deposition of large amounts of sand and other debris. The irrigation and drainage channels were damaged. In addition, sea water intrusion led to development of soil salinity, damaging the present crop as well as making these lands unsuitable for cultivation. Salinity develops in soil due to accumulation of soluble salts. As sea water contains considerable quantities of sodium bearing salts, its intrusion creates soil salinity. In addition, sodium ion creates dispersion of soil particles destroying it's the aggregates or the structure. These factors prompted the immediate need of rehabilitating the lands affected by tsunami disaster.

I. Matara District

198. The proposed 33 kV line from Morawaka to Warukandeniya gantry is located within Matara district of the Southern Province.

- **Geography and physical resources**

199. Matara district which is situated near Nilwala river close to sea is in between Galle and Hambantota districts in Ruhuna. It possesses an attractive land containing in extent 1282.5 km^2. Matara district falls in between 5.8 - 6.4 North Latitude and 80.4 - 80.7 East Longitude. Matara district is bounded on the South by belt of sea, North by Ratnapura district, West by Galle district and East by Hambantota district. Length of the sea belt from Dodampahala up to Midigama in Matara district is 55 km. Mean width from East to West is 35 km. Matara district is administered through 16 Divisional Secretariat Divisions. There are 650 Grama Niladhari divisions. A Highland Complex that consists of metasediments and orthogneisses underlies geology of Matara District.

- **Climate & rainfall**

200. The annual mean rainfall is 2500 mm and the mean annual temperature amounts to 26.7°C. Rivers, canals, lakes can be seen as water sources in the district and major source of water is Nilwala River. Polwatte River, which falls into the sea at Polwathu river mouth, covers a considerable catchment area. Hilly areas such as Kotapola, Pasgoda and Pitabaddara provide pure water. 6 majorlakes and 7 anicuts in the district provide water for the agricultural purposes.

- **Major Ecological Features**

201. Lowland rain forest habitat is the major ecological feature that is found in the Matara District. Although much of the original extent of the rain forest areas have been reduced, an extent of 205 km^2 of rain forest still exists in the Matara District covering about 16% of the Matara District's land area. Tropical Lowland rain forests are commonly found at elevations below 1000 m from sea level. These forests receive an annual rainfall of 2500-5000 mm, and are evergreen with no significant seasonal changes free of long dry spells. Conservation of these tropical forests is crucial as much of Sri Lanka's endemic flora and fauna are found in these valuable ecosystems. A tropical sub mountain rain forest was also found to be present in Matara District, which is the Kalubovitiyana forest. The mangrove forest in Matara District consists of communities of *Rhizophora bruguierra* and Sonneratia.

- **Biodiversity**

202. **Fresh water fish:** Total of 57 species of freshwater fishes belonging to 24 families are recorded from the aquatic habitats of the Matara district. These habitats include natural and manmade systems. Of the total species recorded, 53 are indigenous and four were exotic while 4 of the indigenous species are listed as threatened.

203. **Amphibians**: 29 species of amphibians belonging to 4 families can be seen in Matara district. They represent about 27 % of the island's amphibian fauna and consist of 22 endemic species and 11 nationally threatened species.

204. **Reptiles**: Total of 56 species of reptiles belonging to 12 families can be seen in Matara district, which included 25 endemic and 8 nationally threatened species. One of Sri Lanka's largest reptiles, the Mugger Crocodile (Crocodylus palustris) shows a wide distribution and a population increase throughout the Nilwala river-basin.

205. **Birds**: Total of 131 species of birds belonging to 42 families are recorded, which included 20 endemic and 10 nationally threatened species. The endemic birds such as Sri Lankan Hanging Parrot, Sri Lanka Jungle fowl, Sri Lanka Spot-Winged Thrush, show a wide distribution throughout the forested areas in the Matara district.

206. **Mammals:** 33 species of mammals belonging to 21 families were recordedin the natural habitats of Matara district. This included 6 endemic and 9 threatened species (IUCN Sri Lanka, 2007). Threatened species of Loris (*Loris tardigradus*) and Golden Palm Civet (*Paradoxurus zeylonensis*) are recorded.

207. **Butterflies**: 96 species belonging to 5 families were recorded in the district. This represents about 39% of the island's butterfly fauna. There are 5 endemic and 12 nationally threatened species among them.

208. **Dragonflies**: 51 species belonging to 10 families were recorded. 17 endemic and 2 nationally threatened species are seen among them.

209. **Land snails**: 29 species of land snails belonging to 8 families were recorded from the Matara district, which included 23 endemic and 5 nationally threatened species. Newly described and critically endangered Ratnadvipia karu are recorded in the forest habitats of the Matara district.

210. **Freshwater Crabs:** Total of four species of freshwater crabs were recorded from the Matara district, which included four endemic and no nationally threatened species. Endangered Pastilla ruhuna was the only threatened species recorded in this survey. Ceylonthelphusa kandambyi was the most common species in many forest habitats of the Matara district.

211. Following Table shows the name and extent of Forest Reserves (FR), Proposed Forest Reserve (PR) and Other State Forest (OSF) in Matara district.

Table 20: Reserves in Matara District

Name	Status	Extent (ha)	Name	Status	Extent (ha)
Badullakele	FR	182.3	Panilkanda	FR	588.1
Dandeniya-Aparekka	FR	560.0	Rammalakanda	PR	4.8
Diyadawa	FR	2578.2	Viharekele	FR	825.1
Gallendakuttiya	FR	89.3	Welihena	FR	333.1
Kalugalkanda	FR	62.5	Wellana	FR	85.4
Kekanadura	FR	401.7	Horagala-Paragala	OSF	1800.0
Kirinda Mahayayakele	FR	374.1	Kalubowitiyana	OSF	100.0
Kudagalkanda	FR	151.8	Kurulugala	OSF	175.0
Masmullekele	FR	805.4	Silverkanda	OSF	1000.0
Mulatiyana	FR	3277.5	Derangala	OSF	50.0
Oliyagankele	FR	488.6	Aninkanda	OSF	75.0

- **Social and cultural Development**

212. The population of the Matara district by 2012 amounted to 809,334. The majority of the population is Sinhalese, with a minority Sri Lankan Moor and Indian Tamil population.

Ethnicity	Population	%
Sinhalese	763121	94.3
Sri Lankan Moors	25300	3.1
Sri Lankan Tamils	8562	1.1
Indian Tamils	11984	1.5

213. At present, the majority of land consumption is for estate plantations. Tea, one of major commercial crop is significant and related tea factories. Matara district has recorded third place

in tea plantation among main 8 districts. Coconut plantation can be seen in coastal areas in the district where about 75% belonge to small land owners. Comparatively, since initial capital and labour needed for coconut plantation are minimum rural people have entered this plantation. Rubber plantation and related industries can also be seen in small quantities. In addition, in almost all Divisional Secretary divisions in Matara district paddy cultivation can be seen according to land consuming pattern. Export crop cultivation too has extended throughout the district and cinnamon cultivated land extent is about 7,713.6 hectare. People living in Mulatiyana, Kamburupitiya, Hakmana and Pasgoda have made used cinnamon cultivation to strengthen their economy and significant entrepreneurs in Cultivation of vegetable and fruits are being done as a home garden cultivation using traditional methods. In Matara district, agriculture based industries could be considered major. Among them tea industry is prominent.

- **Health & Education**

214. There are 1 Provincial General Hospital, 1 Base hospital, 4 District Hospitals,4 Peripheral hospitals and 9 Rural hospitals can be seen in the district. Matara district has 04 Educational Zones. Also, 5 Private hospitals and 4 Central Dispensaries and Maternity Homes are established. There are 359 Schools and total number of Teachers is 10035 in this District.

- **Sites of Cultural, Archaeological and Historical Significance**

215. Matara district which has a long history up to Ravana period is situated touching Nilwala River. It is described in Sinhala Mahawansa as the city of aliens, Bengal of wealthy people and institute of intellectuals. It is very apparent that Matara city is the motherland of people enriched with patriotism and religious honour. The city firstly called “Mathota” later became “Mahathota”. Laft sea belt of Nilwala river was called “Mathota”, while right belt as “Mathotagama”. By archeological evidences, it is proved that even before the arrival of Wijaya Prince Matara was an area where the power was under Naga tribe. Mutaseewa king who fled to Ruhuna at that period and prince Mahanama have been identified as the earliest Naga tribesmen. It is mentioned in Mahawansa that Naga tribes have lived in villages like Navimana, Nadugala, Naimbala, Naotunna and Narawelpita. It is further mentioned that Kapparatota in Weligama area had been used by foreign people for anchoring their commercial ships, and Agrabhodhi Vihara of Weligama had been built during the reign of King Devanam Piyatissa. Hathbodhi watte and Matara Bodhi which situated in Matara city were built in the reign of king Kumaradasa.

J. Monaragala District

216. The proposed 33 kV line from Monaragala GS to Wellawaya gantry is located within Monaragala district of the Uva Province.

- **Geography**

217. 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', and the entire area is nurtured with full of natural

resources. 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.

- **Topography**

218. 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.

219. 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.

- **Physical Resources**

220. The soil conditions in the district vary according to the topography and the climate. However, two distinguish 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.

- **Climate and Rainfall**

221. 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.

- **Water resources**

222. 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.

- **Biodiversity**

223. 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 causes 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 threes 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.

224. 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 fauna of the area is not known and as 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.

225. 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 detail 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.

- **Social and Cultural Development**

- **Population and community**

226. 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. Following Table shows the population in each Division of the district. 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 summarizes the population of Moneragala according to different ethnicity:

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

- **Economy**

227. 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.

228. According to 2012 data, the mortality rate and rate of birth are 3.3 and 16.7 per one thousand respectively. There are 262 schools established in the district with 97,721 students.

- **Sites of Cultural, Archaeological and Historical Significance**

229. 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.

K. Badulla District

230. Badulla is a district in Uva Province, Sri Lanka. The entire land area of the Badulla district is 2,861 km². It is bounded by the districts of Monaragala and Rathnapura on the East & South, by Ampara and Kandy districts on the North and by Nuwara Eliya and Matale on the West. The Divisional Secretariats of Badulla district, 15 in number, and further divided in to 567 Grama Niladhari divisions, directly fall under the purview of the District Secretary. Moreover, the district is consisted of 1996 villages and 180 tea estates where the Tamil estate workers dwell. The local administration structure is represented by 14 Pradesiya Sabhas, 02 urban councils and 01 Municipal council.

- **Topography**

231. Badulla District is located to the East of the Central highlands. Physiographically, it is a complex region with mountain ranges, dissected plateaus, escarpments and narrow valleys covering a greater proportion of the district. The Eastern arm of the Central highlands extends towards Dewatagala in the East, through the Southern part of the district. This Eastern range has an elevation ranging from 1200-1800 m. To the East is the North-South aligned Namunukula range beyond which located a section of Lunugala ridges that rise to over 1200 m. The terrain of these ridges is rugged. At the extreme South of the district separated from the Eastern range by a steep escarpment is a section of the Koslanda plateau, with an elevation ranging from 300-1000 m. Encircled on three sides by the Central highlands, the Eastern and Namunakula ranges and Lunugala ridges, is the distinctive and clearly demarcated Uva Basin (elevation below 1200 m). The rim of the Basin and the Uva highlands located in its centre are highly dissected by the Northward flowing Uma, Badulu, Loggal Oyas and their tributaries. Their valley bottoms have undulating floors while the flanking hills rise sometimes to a height of 900 m. The Badulu Oya, for example, flows in a deep valley and its lateral tributaries too have carved up deep valleys on either side. To the West of the Basin rises the Welimada plateau whose general elevation varies between 1000-1200 m.

- **Physical Resources**

- **Geology and Soil**

232. The drier lower areas of the district have red earths and brown loams. The relatively wet higher slopes are characterized by highly leached red-yellow podsols, while their lower slopes have lateritic reddish brown soils.

- **Climate & rainfall**

233. The average annual rainfall in the district is around 2000 mm but it varies from 900 mm in the Northern and Southern most extremieties of the district to over 2500 mm in the Eastern flanks of the Central highlands, Namunukula and Lunugala ridges. During the first intermonsoon season (March to mid-May), the whole district receives about 300-500 mm of rainfall. The district lies in the lee of the Central mountain range during the Southwest monsoon season

which extends from mid-May to September. The total rainfall received during these 5 months therefore ranges between 500-700 mm whereas during the 2 months of the second inter-monsoon season the district receives as much as 500-750 mm.

234. The average annual temperature of the district varies between 20° to 25°C depending on the altitude. At Badulla (670 m), the average temperature is 23.2°C. At higher altitudes as at Passara (1007 m) and Diyatalawa (1248 m) temperature fall to 21.3°C and 20.2°C respectively. Due to the influence of dry and warm katabatic winds, the temperature gradient for stations located on the leeward side of the central highlands is 0.5°C per 100 metres as opposed to the normal lapse rate of 0.65°C per 100 metres on the Western slopes.

- **Forest Resources**

235. The natural vegetation of the district consists of Wet-Zone forests, Intermediate Zone forest, scrubland and grasslands. Following Table 21 shows Forest Reserves (FR), Proposed Forest Reserves, Other State Forests (OSF) and Sanctuaries in Badulla district.

Table 21: Reserves in Badulla District

Name of the Reserve	Status	Extent (ha)	District
Erabedda	PR	1538.9	BAD
Ettalapitiya	PR	269.1	BAD
Haputale	FR	141.3	BAD
Migollegama	PR	141.2	BAD
Namunukula	PR	279.3	BAD
Pattipola	FR	394.9	BAD
Ravana Ella	S	1932.0	BAD
Rawanella	PR	331.8	BAD
Tangamalai	S	131.5	BAD
Udalelegama	FR	17.9	BAD
Welegama	PR	639.0	BAD
Welanwita	OSF	8500.0	BAD
Madigala	OSF	1350.0	BAD
Maduru Oya Block 1	NP	51469.4	BAD AMP POL
Bibilehela	PR	610.0	BAD MON
Hakgala	SNR	1141.6	BAD NUW
Ohiya	PR	1925.5	BAD NUW

BAD- Badulla, AMP- Ampara, POL- Polonnaruwa, MON- Monaragala, NUW- NUWARA Eliya

- **Land use patterns of the district**

236. The total extent of land in the district is 286,100 hectares and 67,258 of this land, which covers 34% of the total area is used for paddy, tea, rubber, coconut and other extra crop cultivation. The area used for chena cultivation and home gardening is about 67,745 hectares and the total land under cultivation exceeds 165,075 hectares. Land use patterns in the district are shown in following

237.

238.

239. Table 222.

Table 22: Land Use Pattern in Badulla District

Land use pattern	Extent of land (ha)	%
Cultivated paddy land		
Irrigation	23792.0	8.3
Rain water	6365.0	2.2
Tea	34042.0	11.9
Rubber	412.0	0.1
Coconut	3608.0	1.3
Cinnamon	428.0	0.1
Other cultivation	28264.0	9.9
Forest		
Dense forest	47782.0	16.7
Open forest	26646.0	9.3
Cultivation forest	7034.0	2.5
Sub lands and chena cultivation	43566.0	15.2
Marshlands	165.0	0.1
Home gardens	24152.0	8.4
Reservoirs	6109.0	2.1
Buildings	823.0	0.3
Sand/Rock lands	4731.0	1.7
Barren lands and abundant lands	28181.0	9.9
	286100.0	100

- **Social and cultural Development**

240. According to the National Census Report 2012, population of Badulla district is approximately 811,758. Gender wise, 48% is represented by males and the rest 52% by the females. The minors below the age of 14 are 224,802. Although 50% of the residents of this district have been employed, the high rate of dependency that reaches 50% of the population is a fact for special consideration.

- **Economy**

241. Of the district's total population, 51% is included in the labour force, that is 439,085 in figures and, 410,521 individuals among them are employed at present. Accordingly, the rate of employment remains at 96% in Badulla district. However, it should be noted that this particular situation, the said high rate of employment had occurred due to the large number of employees in plantation agriculture who represent 64% of the entire occupants. Paddy cultivation is the main agricultural product in the district. The yield of paddy in year 2010 was 125,845 metric tons and in 2011 Yala had been 48,036 metric tons. Comparatively, an adequate improvement in agricultural production had not taken place within this period, mainly due to the conventional methodologies followed by the farmers, which consequently leads to low productivity levels in local agriculture. In addition to the agricultural crops such as tea, coconut and rubber, other minor crops, namely arecanut, pepper and cardamom are cultivated in these areas. Since an agricultural economy is predominant in the district, the production process of paddy, tea, coconut and rubber including other crops should be driven towards income generating targets.

Specially, the government involvement and government incentives are of much crucial in persuading the farmers to use modern technology instead of conventional methods.

- **Sites of Cultural, Archaeological and Historical Significance**

242. The historical records of ancient Uva reveal that, civilized communities ruled under some sought of well-organized structure of governance have had been living in those lands even before this island became under the rule of king Vijaya, known as the first Sinhalese king of Ceylon. The literal history of India provide strong evidence for the famous legend of King" Rawana", who had taken over the area of Rawana ella under his powers 6000 years ago.

243. The most important evidence for the existence of very ancient human habitats of Badulla district is the arrival of Lord Buddha to Mahiyanganaya, in the sake of the well-being of the people lived there at the time and belonged to the tribe called "Yaksha" in 6th B.C. The third visit of Lord Buddha to Sri Lanka again had been to this area, where the sacred "Muthiyangana Raja Maha Vihara" is located at present, as our history explains. One headman known as "Indika" enthused by the voice of Lord Buddha wanted something to worship in the memory of this very holy visit of Lord Buddha. The annals say that Lord Buddha then had gifted some drops of sweat to Indika, which had immediately turned in to pearls. This Chief had built a stupa placing these pearls in it, currently known as the famous "Muthiyangana stupa" of Badulla city.

- **Environmental problems**

244. In the Badulla district, at least nine AGA divisions (Badulla, Bandarawela, Haputale, Kandaketiya, Migahakivula, Passara, Soranatota, Uva Paranagama and Welimada) have seen the occurrence of landslides. Their occurrence is particularly evident during heavy rains and is the result of both the natural and man-made causes. Monsoon rains in Sri Lanka caused a landslide on 29 October 2014, in Haldumulla, killed over a hundred people. Badulla district has experienced several other landslides recently, due to further bouts of monsoon rain, but this latest incident has taken the highest toll in lives of the year.

242. **Biodiversity:** A total of 209 species of flowering plant species representing diverse life forms including epiphytes (one species), shrubs (29 species), climbers (42 species), trees (67 species) and herbs (70 species), were observed from islands in the north of Sri Lanka such as Delft, Nainativu, Analativu and Mannar. Although only two endemic plants were recorded, the rich plant life of islands is a good repository for the indigenous arid zone flora of Sri Lanka. Among the plant species observed on northern Island were two species of particular social relevance to Sri Lanka – Adansonia digitata (baobab) and Ficus benghalensis (banyan).

243. Among the floral species recorded were one Critically Endangered Possibly Extinct (CR-PE) species - *Fimbristylis dipsacea*; three Endangered (EN) species - *Ipomoea coptica, Cocculus hirsutus* and *Peplidium maritimum*; five Vulnerable (VU) species - *Citrullus colocynthis, Tinospora cordifolia, Sporobolus maderaspatanus, Colubrina asiatica* and *Manilkara hexandra*; and 11 Near Threatened (NT) species - *Amorphophallus sylvaticus, Aristolochia bracteolata, Capparis brevispina, Mukia maderaspatana, Erythroxylum monogynum, Jatropha glandulifera, Chukrasia tabularis, Cymodocea serrulata, Salvadora persica, Madhuca longifolia and Cyphostemma setosum.*

244. A total of 146 faunal species including ten dragonfly species, 15 butterfly species, one amphibian species, eight reptile species, 101 bird species and 11 mammal species, have been recorded from northern Islands. Several islands in the north of Sri Lanka including Delft, Nainativu, Anantivu, and Mannar Island support number of bird species that are restricted to the northern region of Sri Lanka or recorded seldom outside the northern region of Sri Lanka such as *Dicrurus macrocercus* (Black drongo), *Lanius schach* (Long-tailed Shrike), *Streptopelia decaoto* (Eurasian Collared-dove), *Francolinus pondicerianus* (Grey Francolin), *Milvus migrans* (Black Kite), *Phoenicopterus roseus* (Greater Flamingo), *Dromas ardeola* (Crab-plover), *Cursorius coromandelicus* (Indian Courser) and *Larus ichthyaetus* (Great Black-headed Gull). This area also supports more than 1% of the total population of at least three species of water birds *Phoenicopterus roseus* (Greater Flamingo), *Anas penelope* (Eurasian Wigeon) and *Limosa limosa* (Black-tailed Godwit).

245. Sri Lanka supports a rich avifauna that stands at 495 species at present. This includes 240 species that are confirmed breeding residents who live year round and breeds in Sri Lanka. Out of the 240 breeding residents, 33 are found only in Sri Lanka (endemic to Sri Lanka). Further, 21 species that are listed as breeding residents, also have migrant population which also include migrants of different races than the species that occur in the country. The remaining species are considered as migrants that can be further grouped into four categories based on their visitation patterns as Regular winter visitors (arrive in Sri Lanka around September and depart Sri Lanka around April), Vagrants (do not show a regular pattern of visitation to Sri Lanka), species whose status is unknown (recorded only once or their inclusion in the Sri Lankan bird list is based on unconfirmed reports) and oceanic birds (use the maritime zone of Sri Lanka).

246. Number of mitigation measures and habitat enhancement methods can be used to mitigate or reduce the impact of high voltage transmission lines or wind turbines on wildlife. The type of mitigation suitable for a given project depends on the local circumstances. Mitigation measures can be used to reduce negative impacts, and in some cases, even enhance wildlife habitat. Some of the commonly used mitigation measures include:

- The best way to avoid negative effects on wildlife habitat is to avoid sensitive sites. For instance, use of areas that have been previously disturbed by man-made or natural events can lessen the magnitude of impacts to wildlife habitat. Likewise, avoiding wetlands that are crucial for the survival of many species of water birds, old growth forests that support a high diversity of species, habitat that is critical for the survival of a species on a local regional or global scale, habitats of endangered species, areas used by wildlife as migratory corridors for a long period of time, and habitats known to be highly productive could reduce the negative impacts.
- Leaving natural vegetation buffers between the line/wind farm and sensitive wildlife habitats.
- Employing construction methods and timing appropriate to the local site (e.g., suspend operations during a sensitive time period such as nest initiation, egg laying, or calving).
- Stabilizing disturbed soil to assist vegetation regrowth and to control erosion.
- Planting shrubs or trees for cover (thermal, escape, hiding, etc.) for targeted wildlife species.
- Protecting fruit and nut trees and shrubs to increase food production which benefits many wildlife species.

- Promoting the regeneration of desirable vegetation.
- Seeding former access roads with selected mixtures of grasses, and shrubs which provide food for many wildlife species.
- Retaining dens and roost trees.
- Using nesting platforms on transmission line towers to enhance raptor habitat.
- Avoiding flashing or non flashing red lights as aircraft warning lights on transmission towers or wind turbines or use of quickly flashing white strobes can reduce collision risk
- Retaining snags and logs.
- Closing access roads when it is necessary to protect a wildlife species during all or part of a year, and when construction is completed.
- The use of appropriate construction techniques and avoiding sensitive areas are the most effective ways to minimize or avoid impacts to the aquatic environment.
- The way in which the vegetation is cleared can affect wildlife habitat. For instance selective logging has a less of an effect compared to large scale clearing using heavy machinery.
- The changes to habitat will also depend on the original vegetation before RoW construction. Impacts may also occur to vegetation and habitat at the edge of the RoW. When trees are cut from the RoW, shade is removed, and sun-scald may damage trees on the RoW edge. This is especially true where ROWs follow an east-west course, exposing a north edge to the hot afternoon sun. As a result, sun tolerant trees will become established and persist at the RoW edge.
- Openings in an otherwise continuous forest canopy may allow winds to fell trees. Wind throw is most common in shallow, organic soils and may increase the area affected by a RoW. This situation is less severe in narrower RoWs and in those parallel to prevailing winds.
- Establishment of ROW will result in trees that had limbs damaged or cut at the edge of the ROW that can lead to dieback. Dieback, usually results from insect or fungal attack on the exposed limb, ranges from affecting only one or two limbs, to tree mortality.

IV. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Environment Impacts and Mitigation Measures

247. The potential environmental impacts associated with the subprojects occur during the pre-construction, construction, and operation phases, which will typically involve:

- Removal of vegetation, including trees and crops for access roads and tower bases.
- Excavation of sites for project facilities (if at all), including transport and disposal of excavated materials, erosion at construction sites, possible noise/dust pollution, and management of workers and waste.
- Impacts of Polychlorinated Biphenyls (PCB)[4] during transformer replacement process, and improper disposal of transformer containing PCB, if required.
- Spills of fuel and other lubricants at the construction site/workshop/repair site that may affect soils and water quality.
- Noise from construction equipment.
- Preservation of cultural sites and artefacts.

- **Environmental Impacts and Mitigation Measures Needed during the Design/Pre-Construction Phase**

B. Route Selection

248. As per the Fauna and Flora Protection Ordinance and Forest Ordinance, all the power lines infringing upon the Protected Areas (National Parks, Strict Nature Reserve, Nature Reserve, Sanctuary, Conservation Forest, Forest Reserve) have to be approved by the CEA. Protected Areas are avoided as far as possible while selecting the tower line routes. Where it is not possible to avoid forests, the routing of the lines in the forest area will be done in consultation with respective forest authorities to minimise damage to the forests and to ensure minimal impact on wildlife.

249. The natural terrestrial environment of the proposed project areas in Ampara, Badulla, Galle, Jaffna, Kegalle, Kurunegala, Matara, Monaragala, Puttalam, Ratnapura and Trincomalee, has already been significantly altered and degraded by conversion into paddy fields, tea, rubber and other mixed cultivations, villages, semi-urban areas with infrastructure facilities such as roads, drains, homes and buildings etc. under various development projects. Therefore, besides cutting of plantation trees, tea and home gardens, the subproject should not cause any significant impacts to the existing environment or affect any environmentally significant areas.

250. Care must be taken that line routes must avoid wetlands and unstable areas especially in Trincomalee district as the line is near the coastal area. The routing of the lines is selected to avoid relocation of people and threats to common property resources. Engineering and biological measures must be taken to prevent soil erosion, impact on agricultural land en-route the line must only be restricted to the construction phase, and adequate compensation as determined by the district authorities (Electricity Act 2009) must be paid to the affected persons.

[4] Polychlorinated Biphenyls (PCB) are mixtures of man-made chemicals and due to their non-flammability, chemical stability and high boiling point have been used extensively as insulators. PCB's are highly stable, toxic and persistent chemicals. Their manufacture, processing and use has now been banned in many countries (USEPA web page on PCBs).

251. The transformers and other equipment used in the project must be free from poly-chlorinated biphenyl (PCB). Production of PCBs has now been banned in most countries and it will be phased-out in 2025, therefore equipment (transformers), if procured under the loan should not contain PCBs. Procurement of new transformers will specify that PCB should not be used and only non-PCB coolant such as hydrocarbon mineral oil will be used. At any stage, during transformer replacement process, if presence of PCB in the existing transformers is confirmed, the Engineering, Procurement and Construction (EPC) contractor will adopt best industry practices with regard to handling of hazardous materials, implement it within its already existing work and safety handling procedures, and will recommend the appropriate disposal of these equipment in accordance with the applicable National and International standards. The same will apply for disposal of existing old diesel generators at Analaitivu, Delft and Nainativu Isalnds with the supply of new generators in the hybrid power systems in three islands.

252. Batteries and transformer oil must be disposed of through lead waste re-processors in accordance with the provisions of CEA and compliance with these provisions must be reported to ADB/CEA through biannual reports.

253. No resettlement requirements will be required for tower lines. Acquisition of lands will be required from the surrounding communities for an approximate 145-250m^2 plot of land required for gantry based switching stations for Gantries land.

254. No major sites of archaeological, cultural, or historic significance are present along the proposed alignment of the tower lines and gantries and land earmarked for hybrid renewable energy mini-grids in three islands.

- **Environmental Impacts and Mitigation Measures Needed during Construction**

255. Environmental impacts identified during construction are limited in size and are temporary. The scale of the works is relatively minor and the project areas proximity to the work force means that no construction camps are required.

256. Fuel and other lubricants will need to be stored at the construction sites. Best industry practice will be required to ensure that accidental spills and discharge to the soil and aquatic environments are prevented. Any fuel (including drums and tanks, if any) should be placed at least 20 m away from waterways and no equipment is to be refuelled within this distance.

257. Only trained personnel should undertake handling of fuel and lubricants. In addition, machinery should be properly maintained and waste oil and oil filters must be disposed of to meet best industry practice. This will be the contractor’s responsibility.

258. At the completion of work, the contractor will be required to rehabilitate and clean up all work sites. This includes repairing damage to pavements, roads, and drainage systems. All waste is to be removed from the sites. The contractor and the CEB will be responsible for implementing this requirement.

C. Removal of Trees

259. The project may require some fruit/non-fruit trees to be removed during the construction activities. **Table 23** gives the list of trees to be felled for subprojects. Approximately 2107 trees will be removed from the ROW of the tower lines. These would include 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.

260. 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 USD 2000 per ha.

261. Compensation is being paid to the tree owners in the private areas as per GoSL norms (Electricity Act, 2009). In home gardens, if trees have to be removed, CEB pays 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 (USD 385) 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 LKR 1000 only. For timber trees e.g. Jak, Mahogany, Sapu, Teak, 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. and the market value of the tree.

Table 23: Total Number of Trees to be felled for distribution subprojects

No	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
DD1				
	Puttalam GS to Keeriyankalliya			
	Mallawapitiya GS to Ratmalgoda	139	05	None
	Maho grid to Ma-Eliya gantry	150	45	None
DD2				
	Wimalasurendra GS to Maskeliya Gantry	00	70	None
	Ampara GS to Uhana Gantry			
	Kappalthurai GS to 6th Mile Post gantry			
	Irakkandy gantry to Kumburupitiya gantry			
	Choisy gantry to Thawalantenna			
	Kegalle GS to Givilipitiya gantry	59	675	None
DD3				
	Badulla GS to Ella			
	Mahiyanganaya GS to Bibile	73	173	10
	Ratnapura GS to Idangoda via			

No	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
	Ketaliyanpella			
	Monaragala GS to Wellawaya	83	70	320(Teak)
DD4				
	Morawaka to Warukandeniya	53	56	None
	Elpitiya 11th Mile Post to Mattaka	73	53	None
	Matara GS to Yakabedda			

262. No declared wildlife sanctuary and national parks are located near the project-affected area. These line routes have been demarcated avoiding all populated areas, and any possible ecologically sensitive areas. However, noise, vibration, and emission from construction vehicles, equipment will occur during construction and pre-construction stages in temporary manner. Table 244 gives the details.

Table 24: Distance from WLS and National Parks for all subprojects

	Sub-project	Nearest Aerial Distance (km)	Protected Area	IUCN Category
DD1				
	Puttalam GS to Keeriyankelliya			
	Mallawapitiya GS to Ratmalgoda	11.2	Rambodagalla proposed forest reserve	II
	Maho grid to Ma-Eliya gantry	11.7	Pallekale forest reserve	II
DD2				
	Wimalasurendra GS to Maskeliya Gantry	10.6	Peak Wilderness sanctuary	II
	Ampara GS to Uhana Gantry			
	Kappalthurai gantry to 6th Mile Post gantry			
	Irankandy gantry to Kumburupitiya gantry			
	Choisy gantry to Thawalantenna			
	Kegalle Grid to Givilipitiya gantry	2.9	Kegalle sanctuary	II
DD3				
	Badulla GS to Ella			
	Mahiyanganaya GS to Bibile	20.2	Victoria Rantabe Randenigala sanctuary	II
	Ratnapura GSs to Idangoda via Ketaliyanpella			
	Monaragala GS to Wellawaya	19.7	Yala National Park	II
DD4				
	Morawaka to Warukandeniya	3.7	Dellawa forest reserve	II
	Elpitiya 11th Mile Post to Mattaka	5.3	Polgahakanda forest reserve	II
	Matara GS to Yakabedda			

- **Distance from Sensitive Receptors**

263. Distance from various receptors is give in Table 25 below:

Table 25: Approximate distance of subprojects from sensitive receptors

SNo.	Name of Subproject	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Population/ Inhabitant (in pockets)	Metal access path to the Site
	33 kV Lynx DC line from Mallawapitiya GS to Ratmalgoda							
1	33 kV Lynx DC line from Mallawapitiya GS to Ratmalgoda	0.47 km to Samodaya Maha Vidyalaya	0.44 km to C.W.W Kannangara M.V	0.43 km to Mallawapitiya junction temple	0.5 km to Pothuhera village hospital	2.5 km to Kurunegala General Hospital &		Mallawapitiya –Keppetigalla road

SNo.	Name of Subproject	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Population/ Inhabitant (in pockets)	Metal access path to the Site
2	33 kV Rathmalgoda Gantry	None	0.62 km to Rathmalgoda Maha Vidyalaya	0.77 km to Rathmalgoda Raja Maha Viharaya	None	04.25 km to Polgahawela District hospital		Kurunegala – Trincomalee highway
	33 kV Lynx DC line from Maho GS to Maeliya							
1	33 kV Lynx DC line from Maho GS to Maeliya	4.63 km to Vijayaba primary school	4.43 km to Vijayaba National school	1.77 km to Daladagama Abayarukkarama Viharaya	1.74km to Ipalogama medical centre	5.93 km to Mahawa district hospital		Nikaweratiya-Moragollagama road
2	33 kV MaEliya Gantry	2.66 km to T.B Wijesooriya Kanishta Vidyalaya	3.92 km to Ponnilawa Maha Vidyalaya	0.58 km to Siri Mangala Piriwena	1.42 km to ayurvedic Dispensary, Rambe	9.24 km to Polpithigama government hospital		Ibbagamuwa – Madagalla road
	33 kV Lynx DC line from Wimalasurendra GS to Maskeliya							
1	33 kV Lynx DC line from Wimalasurendra GS to Maskeliya	None	2.16km to Kiriwan Eliya school	3.49 km to Sri Upanandaramaya	4.32 km to Watawala hospital	16.35 km to Nawalapitiya General hospital		B71
2	33 kV Maskeliya Gantry	None	3.82 km to Dik oya school	2.37 km to Anglican Christ church warleigh Dickoya	1.58 km to Maskeliya Government hospital	2.41 km to Dik oya base hospital		B149
	33 kV Lynx DC line from Kegalle GS to switching gantry at Gevilipitiya							
1	33 kV Lynx DC line from Kegalle GS to switching gantry at Gevilipitiya	0.62 km to Molagoda Primary school	1.79 km to Puwakdeniya Vidyalaya	0.51 km to Kumbaldiwela Temple	5.89 km to Medisewana Pvt Hospital	5.27 km to Kegalle Teaching Hospital		A1
2	33 kV Gevilipitiya gantry	3.81 km to Debathgama school	6.41 km to Alapalawala Central Collage	1.26 km to Polambegoda Maha Piriwen Viharaya	1.29 km to Aranayaka Hospital	13.66 km to Kegalle Teaching Hospital		Mawanella – Horawela road
	33 kV Lynx DC line from Mahiyanganaya GS to Bible							
1	33 kV Lynx DC line from Mahiyanganaya GS to Bible	None	6.70 km to Gamini Dissanayake Model school-Pallewatta	0.18 km to temple in Dehigolla	None	3.76 km to Mahiyanganaya base hospital		Mahiyangana-Padiyathalawa highway
2	33kV Bible gantry	None	0.40 km to Darma Pradeepa Maha Vidyalaya	0.44 km to Bodirukkaramaya Temple	None	0.78 km to Bibile District Hospital		A5
	33 kV Lynx DC Line from Monaragala GS to Wellawaya							
1	33 kV Lynx DC Line from Monaragala GS to Wellawaya	0.24 km to Maduruketiya Kanitu Viduhala	11.25 km to Dutugemunu Central College	2.52 km to Pokunugama Temple	5.66 km to Monaragala nursing home	6.46 km to Monaragala General hospital		A4
2	33 kV Wellawaya gantry		3.08 km to kumaradasa maha vidyalaya	0.47 km to Islamic Mosque in Wellawaya Junction	0.62 km to Wellawaya hospital	15.76 km to Buttala general hospital		A2
	33 kV Lynx DC line from Warukandeniya to Morawaka							
1	33 kV Lynx DC line from			2.96 km to Batuwangala Maha Vidyalaya	5.95 km to Lankagama cenral	19.06 km to Central hospital		B363

SNo.	Name of Subproject	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Population/ Inhabitant (in pockets)	Metal access path to the Site
	Warukandeniya to Morawaka				dispensary	Pitigama		
2	33kV Morawaka gantry	1.05 km to Morawaka primary school	1.34 km to Morawaka Keerthi Abeywickrama National school	0.62 km to Vijaya Piriwena	8.33 km to Kosmodara rural hospital	2.15 km to Morawaka Hospital		B363
	33 kV Lynx DC line from switching gantry Elpitiya 11th mile post to Mattaka							
1	33 kV Lynx DC line from switching gantry Elpitiya 11th mile post to Mattaka	0.45 km to Ananda Cental college primary, Elpitiya	0.07 km to Ananda central college, Elpitiya	0.49 km to Sri Bodirajaramaya	None	0.40 km to Elpitiya base hospital		B114
2	33 kV Mattaka gantry	3.72 km to Bambarawana junior school	10.0 km to Vidyaraja national school	0.70km to a temple near Apa mawatha (Pitigala – Mapalagama road)	0.50 km to Mattaka central dispensary	9.47 km to Elpitiya base hospital		Mattaka – Bambarawana road

- **Environmental Impacts and Mitigation Measures Needed during Operation**

264. Once gantry switching stations and lines are fully erected, fencing, danger signs must be installed that clearly identify and warn of the dangers of climbing into an operational substation. Signage, meeting the IEEE[5] standards will need to be placed on all overhead towers warning of the electrical hazards. EPC contractor will also need to advise the community about the location and associated dangers of the overhead feeder line.

- **Environmental impacts and Mitigation of Desalinisation Plants**

265. Reverse osmosis is a process in which dissolved inorganic solids (such as salts) are removed from a solution (e.g. water). This is accomplished by the filtration of water through a semi-permeable membrane. The membrane allows only the water to pass through, not the impurities or contaminates. These impurities and contaminates are removed to environment as effluent. In general, the reverse osmosis method is used for the filtration of contaminated drinking water as well as desalination of seawater. However, performance of the filter depends on incoming water pressure, water temperature, types of total dissolved solid and quality of the filter membrane. While reverse osmosis system quality can be very different with the component used. These differences can have a significant impact on the quality of the water the system produces.

266. Effluents of seawater desalination using reverse osmosis plant critically impact on surrounding environment. For instances, it can significantly change the groundwater quality, can locally impact on coastal water quality due to saline brine which may be increased in temperature, mixing of residual chemicals with natural water (such as chlorine which used in pretreatment process) and due to mixing of heavy metals by corrosion of treatment plants. In

[5] Institute of Electrical and Electronics Engineers.

addition, effluent water having higher density than the sea water, hence oxygen is less soluble after mixing with coastal water which can impact on marine organism.

267. Therefore, the effluents of reverse osmosis filter is having multi-component of waste, which can observed multiple impacts on sediment, water and marine organisms. However, the impacts also depend on the composition of sea water that used for the plant and also depend on the climatic conditions of the area such as temperature and rainfall variation. In addition, continental shelf morphology is also critical factor for the changing salinity of coastal water from the effluent of the plant. The proposed treatment plant will be located in Analaitivu or Nainativu Islands in Jaffna which have higher permeable sandy aquifer which can significantly impact on groundwater quality as well.

268. In order to maintain prevailing natural conditions of the water, it is necessary to obtain baseline data from groundwater and costal water resources in the area periodically. Those baseline conditions should maintain during the purification process. Removal of effluents to the environment should be done after studying the chemical composition of them and if heavy metals and harmful chemical constituents are reported, necessary removal method should be implemented. However, salinity levels of water around the effluent releasing area can be managed by controlling effluent releasing rate. In general, these two islands are receiving relatively lower rainfall and due to dry climatic condition the impacts of effluent can be significant.

D. Environmental Management Plan

269. 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.

270. The Environmental Management Plan (EMP) for the project is attached as **Annex 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.

271. A summary environmental impact matrix and the mitigation measures are given in Table 26 below.

Table 26: 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 activities 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	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
2.	Climate	No impacts on the climatic conditions	Direct/Local/ irreversible	X			No measurable impact on the climatic conditions, hence no mitigation is required	
B.	**Environmental Resources**							
1.	Air Quality	Project will have marginal impact on air quality during the construction period due to increase in the dust emission.	Direct/Local/ reversible	X			Water sprinklng at construction site, limited bare soils, maintenance of vehicles etc.	During construction activity
2.	Noise	Noise due to general construction activities.	Direct/Local/ reversible	X			Restriction of noise generating activities at night and use of personal protective equipment like ear plugs, mufflers etc.	During construction activity
		Noise arising from humming noise from transformers	Direct/Local/ reversible	X			To maintain a safe distance or provide proper shielding near residential areas	During operational phase
3.	Surface and Ground Water quality	Runoff from the construction site	Direct/Local/ reversible	X			Careful siting of towers and gantry.	Before and during construction activity
		Domestic wastewater from construction sites	Direct/Local/ reversible	X			During line and gantry construction, domestic wastewater treatment may be done by digging small ditches for waste water and then covering it with top soil once the construction team moves to next location.	During construction and operation
4.	Soils and	Soil erosion due to	Direct/Local/				Avoiding sites, which are	During and after the

Sl Nº	Environmental Attribute	Potential Impacts	Nature of Impact	Magnitude of Impacts			Mitigation Measures	Implementation & Monitoring
				Low	Medium	High		
	Geology	excavation for tower bases and clearing of vegetation in the ROW.	reversible				prone to soil erosion. Levelling of construction sites.	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 have been avoided as far as possible during the route selection. Minimise encroachments, and indirect impacts.	Before and during construction phase
3.	Aquatic Ecology	Runoff water from construction site and labor camps.	Direct/Local/ reversible	X			Ensure suitable setback for these temporary sites and ensure proper collection and treatment of waste water.	During construction and operational phase
3.	Aquatic Ecology	No significant impacts envisaged	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.	Before and during construction phase
D.	**Human Environment**							
1.	Health and Safety	Fires, explosion and other accidents at the route alignment of MV line.	Direct/Local	X			Use of personal protective equipment during construction. By lopping 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			MV lines do not cause too much EM fields	Before and after the construction phase.
2.	Agriculture	Permanent and temporary loss of agriculture land due to pole erection	Direct/Local/ reversible	X			Avoid prime agriculture land. Assessment of land required and compensation. Construction activity in the field/cultivation area after crop is harvested and there after crop will not be sowed at the site until construction is complete.	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/ reversible	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/ reversible	X			No archaeological, historical or cultural important sites are affected, 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 proper access roads	During construction phase
7.	Solid Waste Generation	Probability of Surface and ground water 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 construction and operation phase

V. ANALYSIS OF ALTERNATIVES

A. CEB'S Approach for Route Selection

272. At the planning stage, one of the factors that govern the establishment of the tower line 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 distribution system for a generation project or as a part of distribution grid, preliminary route selection was done by CEB based on the interpretation and walk over surveys according to the 1:50,000 maps/topographical maps of the area.

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

i. The route of the proposed tower lines does not involve any human habitation.
ii. The route of the tower line does not affect any monument of cultural or historical importance.
iii. The proposed route of tower line does not create any threat to the survival of any community with special reference to tribal community.
iv. The proposed route of tower line does not affect any public utility services like playgrounds, schools, other establishments etc.
v. The line route does not pass through any sanctuaries, protected Areas etc.
vi. The line route does not infringe with area of natural resources.

B. Alternatives for Line Alignment

274. The subproject will put up new gantry based switching station on feeders and auxiliary 33/0.4 kV transformer. The work will be carried out by setting up gantry based structures on poles and seek 20 m ROW clearances for 33 kV express tower lines. The CEB norms for setback and other parameters are given in **Annex 1**.

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

i. As a principle, distribution alignments generally pass through major towns but whenever possible, to account for future urban expansion, the minimum ROW distance (total 20 m for 33 kV lines as per CEB norms) shall be kept 10 m away from any houses or structures .
ii. Construction activities do not adversely affect the population living near the proposed lines and does not create any threat to the survival of any community with special reference to tribal community or any public utility services like playgrounds, schools, other establishments etc.
iii. 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.
iv. The MV/LV line route does not infringe with area of natural resources. Alignments are selected to avoid wetlands and unstable areas for both financial and environmental reasons.
v. The route of the MV/LV line does not affect any monument of cultural or historical

importance.

vi. Ensure that Polychlorinated Biphenyls (PCBs) are not used in the transformers installed in the project funded facilities.

vii. In addition, care is also taken to avoid/minimise protected parks/national parks, bird sanctuaries and any other forest area rich in wild life. Proper care shall be taken to avoid areas of high density of trees if the line passes through any forest reserve and appropriate approvals of Department of Forests and Department of Wildlife, Sri Lanka.

276. In order to achieve this, CEB has undertaken route selection for individual gantry based switching stations/33 kV lines 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 the national law, CEB has the Right of Way (RoW), yet it considers alternative alignments during site selection, with minor alterations often added to avoid environmentally sensitive areas and settlements at the implementation stage.

277. Keeping above in mind, various alignments of lines were considered taking care of above factors. All such different alternatives were studied by the CEB officials before being proposed to ADB for funding to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental and social impacts for their proper management. **Annex 2** gives the location analysis for the gantry. **Annex 3** gives an illustrative evaluation analysis of the alignments of 33 kV line. **Annex 4** gives the inventorization along the proposed 33 kV lines.

278. Table 27 gives the summary of the final evaluation of the site selection.

Table 27: Summary of final alternative taken for Project Consideration

SNo	Project Component	Alternative Chosen	Reason
DD1	**Puttalam - Keeriyankalliya 33 kV**		
	33 kV tower line Puttalam GS to Keeriyakalli gantry (27 km)	Alternative which traverses through paddy fields.	Avoids residential areas, home gardens
	Keeriyankalli Gantry		
	Mallawapitiya- Rathmalgoda 33 kV		
	33 kV tower line Mallawapitiya GS to Rathmalgoda gantry (16 km)	Alternative which traverses paddy fields and cocnut land	Avoids Bogamuwa school, home gardens
	33 kV Rathmalgoda Gantry	Highland area next to a paddy field	Proposed site was in a paddy field
	Maho GS to Ma Eliya 33 kV		
	33 kV tower line Maho GS to Ma Eliya gantry (24 km)	Alternative which mainly traverses through paddy fields	Avoids home gardens, houses
DD2	**Wimalasurendra GS to Maskelliya 33 kV**		
	33 kV tower line from Wimalasurendra GS to Maskeliya gantry (10 km)	Alternative which traverses through tea estates.	Avoids residential areas, home gardens
	33 kV Maskeliya Gantry		
	Ampara to Uhana 33 kV		
	33 kV tower line from Ampara GS to Uhana gantry (10 km)	Alternative which passes mainly through paddy fields	
	33 kV UhanaGantry		
	Kappalthurai to 6th Mile Post 33 kV		
	33 kV tower line from Kappalthurai to 6th mile post gantry (15 km)	Same alignment	
	Irankandy Kumburupitiya 33 kV		
	33 kV distribution linr from Irankandy gantry to Kumburupitiya gantry (6.5 km)		

SNo	Project Component	Alternative Chosen	Reason
	Choisy Thawalamtenna 33 kV		
	33 kV tower line from Choisy gantry to Thawalamtenna gantry (5 km)		
	Kegalla- Gevilipitiya 33 kV		
	33 kV tower line from Kegalle (Molagoda) GS to Gevilipitiya gantry (11 km)	Alternative which passes mainly through paddy fields	Avoids residential areas, houses
DD3	**Badulla Ella 33 kV**		
	33 kV tower line from Badulla GS to Ella gantry (16 km)	Alternative which passes mainly through degraded lands	Avoids residential areas, houses
	Mahiyanganaya Bibile 33 kV		
	33 kV tower line from Mahiyanganaya GS to Bibile gantry (30 km)	Alternative which passes mainly through degraded lands	Avoids residential areas, houses
	Ratnapura Idangoda 33 kV		
	33 kV tower line from Ratnapura GS to Idangoda gantry (19 km)	Alternative which passes mainly through degraded and rubber lands	Avoids residential areas, houses
	Monaragala Wellawaya 33 kV		
	33 kV tower line from Monaragala GS to Wellawaya gantry (34 km)	Alternative which passes mainly through degraded lands	Avoids residential areas, houses
DD4	**Morawaka Warukandeniya 33kV**		
	33 kV tower line from Morawaka gantry to Warukandeniya gantry (18 km)	Alternative which mainly traverses through degraded lands	Avoids residential areas, houses
	Elpitiya Mattaka 33 kV		
	33 kV tower line from Elpitiya 11th Mile Post to Mattaka gantry (11 km)	Same alignment	
	Matara Yakabedda 33 kV		
	33 kV tower line from Matara GS to Yakabedda gantry (18 km)	Alternative which mainly traverses through paddy fields	Avoids residential areas, houses

- **Reasons for the final selection**

279. Considering the various reasons based on information in the **Annexes 2, 3**, and **4**, the alignments selected were found to be most suitable as they involved lesser populated area, plantation/forest areas, and minimum ROW problems. In addition, a minimum disturbance to the reserve forests has been caused as the route of the line shall be utilised which has more degraded lands.

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

280. 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.

281. Public consultations were conducted in project-affected area between 12th November 2015 to 30th December 2015. 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. Table 28 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 28: Public Consultations

SNo	Name of the Component /Site	Name of the Village, Gramasevaka Division, District, Province	Distance from Project Location	Names of the Participants
1	33 kV Lynx DC line from Mallawapitiya GS to Ratmalgoda (16 km)	Bogamuwa, Handugala, Mallawapitiya, Polgahawela Kurunegala district, North weatern province	0.2 km	Ms. W.A. Hemalatha, Ms. T.M. Jayawathi, Ms. Mallika Rajapaksha, W.A.S.R. Basnayake, Ms. Chandani Kumari Samarakoon, A. Ranasinghe, H. Gunasiri, Ms. M.P. Pasona, Ms. W.A. Hemalatha, W.A.G. Basnayake,
2	33 kV Rathmalgoda gantry Gantry	Rathmalgoda	0.3 km	W.M. Sarath Bandara, Ms. T.M.D. Manel, M.P. Dahanayake, Roshan Arambepola, W.K.U. Ranathunga, Ms. G. Anulawathi, W.K. Bodhidasa, Ms. D.S.V. Priyadarshi ,J.B. Chandrasiri, R.M.N.G. Weerasekera (Women- 8)
3	33 kV Lynx DC line from Maho GS to Ma Eliya (24 km)	Wilwa, Embogama, Rathhinukwewa Kurunegala district, North Western Province	0.2 km	T.M. Avushadahamy, W.A.M. Jayathilake Banda, A.M. Piyadasa, Ms. D.M. Rathnamalala, W.M. Ananda Wanninayake, C.A.H.M. Priyantha Chandrasena, R.M. Rathnayake , Nilanga Aruna, W.M.M.A.P. Wanninayake,
4	MaEliya Gantry	Ma Eliya	0.4 km	Ms. W.M. Chandrawathi, W.M. Anil Wanninayake, W.M.P. Wanninayake, Ms. W.M. Priyanka, Ms. W.M. Pathma Kumari, S.M.K. Senanayake , Ms. W.M. Shammi Anushika, R.M.S. Rathnayake, W. M. Nissanaka Bandara, Ms. H.A. Seetha Kumari, W.M. Rathnayake, Ms. W.M.D. Kumarai, Ms. S.A.H. Nayana, R.M.M.S. Rovuz(Women – 11)
5	33 kV tower line Wimalasurendra GS to Maskeliya Gantry (10 km)	Castlereigh, KudaMaskeliya Nuwara Eliya district, Central Province	0.4km	R, Ravichandiran, S. Theivanai, S. Marimuththu, Ms. V. Vijayalechumi, Ms. M. Sasikala Srimathi, G. Bonbeelex Ms. K. Ludharshany, S. Mahendran
6	33 Maskeliya Gantry	Maskeliya, Nuwara Eliya	0.3 km	U. Paalraj, M. Ramachandran, P. Subramaniyam, S. Vinayagamoorthi, Ms. M. Nirmala Devi, Ms. V. Kamaladarshini, Ms. V. Jeevarani, Ms. S. Mariyai , Danushka Prasad, G.L. Charith Madhusanka , K.D. Hasanga Nuwan, P.A.T.H. Madhubashitha , Ms. S.G. Nishani Sandamali, H.M. Hemachandra , T.M. Gamini Ranjith (Women -7)
7	33 kV tower line	Karadupana estate, Vekikannawatta,	0.3 km	Ms. Poowathi, Ms. Marivelan, Ms. M. Manjuladevi, Ms.

SNo	Name of the Component /Site	Name of the Village, Gramasevaka Division, District, Province	Distance from Project Location	Names of the Participants
	Kegalle GS to Gevilipitiya gantry (11 km)	Kegalle district, Sabaragamuwa Province		R. Vijaya Shanthi, Ms. T. Shantha, V. Padimala Jothi M. Ponniah, S. Kamalan, Ms. K.L. Gunawathi , H.N.K.N. Bandara , M. Piyasena , Ms. N. Seethadevi
8.	33 kV Gevilipitiya Gantry	Geviliptiya	0.5 km	Indika sarath, Ms. K. Malarvili, V Pushpam, Ms. R Nadeeka niroshani, S. Kamalam, A. Sivakumar, M. Kanagamalam, K. Vimalanadan, K. Anandan, Ms. S. Mallika, R. Thiyaka Raja, Ms. M Rukmani Devi, Ms. T Pathma Loshani (Women – 10)
9	33 kV tower line Mahiyanganaya GS to Bibile (30 km)	Arawatta, Gemunupura, Maraketiya Badulla, Monaragala district, Uva Province	0.3 km	C. Jayasekara Ms. W Maheshika Dilrukshi, Ms. L.P Nanda Malkanthi, Ms. W.M Leela Weerasinghe, Ms. G.H.N Pathma Kumari, R.D Piyadasa, Ms. R.M Sumithrawathi, Ms. H.G Rasika Kumari, E.N.K
10	33 kV Bibile Gantry	Bibile	0.2km	Tennakoon, Ms. R.D Dileesa, Ms. P.R Premalatha, A.M Arunashantha, Ms. H Sriyani Manel, H.L Prasad Sanjeewa, Ms. M. Chamila Sudharshani, Ms. L.H Kumudini Priyangika, Ms. N.K Madusha Malkanthi, H.A Lakshman, Ms. Nalani Chandrawathi, A.M.K Alahakoon, Ms. R.M Nalani, H.M.S.P.B Herath, A. Simon, P. Sumathipala, Ms. D.M Gnnawathi, N.J.S Gunadasa, Ms. S.J.M Nilanthi Priyadarshani (Women – 16)
11	33 kV Lynx D/C line Monaragala GS to Wellawaya gantry	Veheragala, Buttala Monaragala district, Uva Province	0.5 km	Ms. D.M. Ariyawathi, Ms. R.M. Nayana Nandani, Ms. K.D. Nishanthi, Ms. Seetha Malkanthi Rajapaksha , M.G. Gunapala, Ms. Sita de Silva, Ms. Nandani Wijayathilake , Ms. K.H.M. Nirosha Priyangani, Ms.
12	33 kV Wellawaya gantry	Wellawaya		K.H.M. Leelawathi, Ms. A.N. Karunawathi , C.J Kumara, Ms. W.M Nirasha Madushani, Ms. W.M Madusha Dilrukshi, Y.A.D Lionel, Ms. K.W.A Srimali Perera, G. Weerawardana, Ms. J.M Charlet Jayaweera, Ms. G Miurangi Dinusha, Ms. D.M. Indrani, R.M Jayasundara, A.A. Subasingha, D.B Dissanayake, R.H. Gunathilaka, R.M. Nuwan, A.J.M.P Senevirathna, S.M. Sunil Udaya Kumara, R.M. Sujeewa Lakmal, H.M. Gunasekara, R.M. Rathnayake (Women – 15)
13	33 kV Lynx D/C line Elpitiya to Mattala gantry	Ketandola, Rassanwila, Galle district, Southern Provinc	0.4 km	W.S.B Ruwan kumara, Ms. B.V.L Shalika, K.K Guruge, P.K Tharindra Dilip, S. Sellappam, K. Mahendran, Ms. S Janaki, Ms. G.K Kusumawathi, B.M Dammika Prasanna, Ms. P Shamali Nisansala, G Gunathilaka Pathirana ,
14	33 kV Mattaka gantry	Mattaka		Mahesh Maduranga, Gayan Kumara, Pradeep Gunathilaka (Women- 4)
15	33 kV Lynx D/C line Morawaka Wrukandeniya gantry	Happpitiya, Alapaladeniya Matara district, Southern Province	0.5 km	A. Premasiri, Ms. Indra Athukorala, H. Jayarathna, Ms. Sumanawathi, Chamila Sampath, Ms. Isurika Dilhani, Dinesh Maduranga, H.G Jimel, K.D Kusalawathi, B.L Janapriya, P.A Kusum, Ms. Malani Kaluaarachchi, Ms.
16	Warukandeniya gantry	Warukandeniya		A.A Indra, I.W Ihalavithana, P.L Chandrasiri, P.L Ruwan, P.L Shamika, Ms. M.G Chandralatha, Ms. Sopinona, Kasun Chamika(women- 6)

A. Consultation Findings

Mallawapitiya GS - Rathmalgoda 33 kV line

282. At Bogamuwa, villagers said that the people may not object lines traversing over paddy fields. They will not like lines traversing over home gardens, highlands and coconut lands. Several people have coconut lands and coconut based industries. If coconut trees are affected, people who depend on coconut industry will lose their livelihoods. Parents will also raise objections if the lines crossed-over school buildings and premises because it is insecure for children. The school will not be able to construct storied buildings. The value of land will decrease and we may not be able to build storied houses. CEB will expand their lines from time

to time and cut down our trees. We will be helpless. We need cash compensation for all our losses. Compensation should be not only for the trees that will be fell down but also for loss of incomes, decrease of land values, deprived opportunities for future cultivations etc. We are not satisfied with compensation paid only for the trees. Clean drinking water is available in this area throughout the year. Almost all the households have private wells. Most households have water motors to pump water from the wells.

283. Handugala villagers said they have no objection to development programs. However, if it adversely affects our lives and property, we are concerned about it. People have only limited land plots. Therefore, electricity lines should be installed far away from people's private property. We expect compensation for loss of our properties, cultivations, crops and trees. If our lands were lost due to the project, we should be given alternate land in the same area (we cannot go outside and live) and houses should be built for us. We do not have money to build houses. The GND has about 500 households and all are Sinhalese. There is a cooperative store, a family health worker, and a grama niladhari in this village. Drinking water is scarce particularly during dry season.

Maho GS - Ma-Eliya 33 kV line

284. Wilawa villagers said that they have no objection to the project. Such projects should be implemented for the development of the country. We are planning to erect a Buddha statue under the Nuga tree at the junction. The project should save this land for us. There is already a 33 kV line traversing over the area. It does not go over the houses. It traverses mainly over paddy fields and tanks. We have no objection if the lines did not affect us adversely. People may object if the lines traverse over their houses. If the lines cross-over coconut land, some trees may have to be cut-down. Paddy fields are cultivated during *Maha* season. They do not cultivate their fields during *Yala* season. Therefore, construction work should be carried out during *Yala* season (April – August) to minimize destructions to crops. People may not be able to construct houses with upstairs. Land values will decrease. Therefore such adverse situations should be avoided. Since the project will not affect our residences (as explained), we have no objection. But if coconut trees are fell down, we should be paid compensation. The land values in this area are high because of the recent road improvements. We expect cash compensation for both crops and land affected by the project. We do not need compensation only for crop losses. If the land values diminish due to electricity lines, or people are unable to construct houses, such land owners should be compensated. There are about 175-200 households in this village. Each single family has 4-5 members. The population in the Wilawa village is around 500. All are Sinhala Buddhists. There are about 12 small tanks which irrigate the paddy fields. There is a community hall in which a pre-school is run by the Pradeshiya Sabha. There are 2 retail groceries. There are around 350 households in this area. 95% of the people are Sinhala Buddhists while the rest is Sinhalese Catholics. People are dependent on seasonal rain-fed agriculture. Around 30% of the population is employed in government jobs. As the water from the wells is brackish, people have been advised by the Health Ministry not to use such water for consumption purposes. The National Water Supply Board provides tap water and around 80% of the households have obtained water connections. People who did not have tap water collect drinking water from their neighbours who are connected to tap lines.

285. We have no objection to the project if people get electricity. However, the project should not adversely affect the people at Ambogama and Ratehinukwewa. The project should not adversely affect the residences of the people. We do not have a major problem if it affected our cultivations. We should be paid compensation if the project affected cultivations. We need fair compensation if our coconut trees were fell down. There are about 90 households. All are Sinhalese. There is a school and a temple. The school has classes upto GCE OL. The divisional secretariat and the hospital are in Mahawa. There is one retail grocery. People buy their essential groceries from Mahawa town. Most households have their private dug wells. As the well water is brackish, they have to filter the water before drinking. However, some people do not filter water.

Wimalasurendra GS to Maskeliya 33 kV line

286. At Castlereigh villagers said, it is good if electricity was provided to this area. It will help the development of this area. People will build new houses (People's common knowledge is low and it was difficult to help them understanding the project). Land mostly belong to the plantation companies (people did not know that they can claim compensation for land acquired). Since people do not have ownership to the land, they would agree with whatever the officials tell them. There are about 250-300 households in this area. 99% are Tamils. Of them, 90% is Hindus by religion. There is a Hindu Kovil and 2 Christian churches. Buddhists worship a small bodhiya. There are 3 retail groceries, a tea factory and 2 big restaurants. A hotel is being constructed. Tourists come to this area using sea planes which are landed on Castlereigh reservoir. Many plantation companies are developing tourist guest houses and they are less interested in developing the tea industry. Tourism brings them good profits**.** The estate management has built a huge water tank to store water flowing from a spring. Some households are provided with water taps from this tank directly to their households. Others have obtained water connections to their homes at their own cost. Water levels in the tank decreases during the dry season and people face problems due to scarcity of water [Castlereigh; Osborne].

287. KudaMaskeliya villagers said the project should not affect the tea bushes. It is our source of livelihood. Machinery used for construction can destroy the tea bushes. Such things should be avoided. Also, when electricity towers are installed in the upper sections of the estate and due to vehicle and heavy machinery movements during construction period, it can even lead to landslides [Osborne]. We are aware of this project. People in this village requested CEB to remove the electricity lines that traverse over the Bodhiya. CEB agreed to remove the lines and take them towards the location where the proposed gantry is to be constructed (The land for the temple was given by Norwood estate at the request of the temple society. The land is managed by a temple in Maskeliya. We do not know whether the ownership of the land lies with the temple or the divisional secretary). We have no objection to the erection of new electricity lines. The new lines will traverse over two retail groceries and 4 residential units. It is not a major problem for us. We do not like electricity lines traversing over residential dwellings. It is risky and threatens life. If electricity lines traverse over someone's house, such affected households should be provided an alternate house in a more secure place. If the project causes any damages to tea plantation, compensation should be paid to the estate [Osborne]. If any trees are to be cut down, we expect cash compensation for it. But we do not have many tall trees. So it will not be a major issue for us. There are about 250 households. The number of

Sinhalese households is less than 10. 90% are Hindus; 8% Christians; 2% is Buddhists. The village has 4 retail shops, 1 saloon, a Hindu kovil, a dispensary, a pre-school and a child care centre [Osborne]; There are about 10-15 households and 4 retail groceries located closer to the location identified for the proposed gantry. The total population within the grama niladhari division is about 135 households. Of them, 120 are Sinhalese; 15 Muslims; and 5 Tamils. The divisional secretariat is in Ginigathhena which is 30 km away. There is a divisional hospital in Maskeliya which is 3 km away. The district hospital is in Dikoya, 12 km away. The main hospital is in Nawalapitiya and people obtain treatment from this hospital for serious illnesses. There is a high wastage of water. Many people have not fixed taps to water lines. People get very clean water from a tank constructed under a rural water supply scheme. A local politician supported this. People are not charged for water.

Kegalle GS - Gevilipitiya 33 kV line

288. At Karandupana estate villagers said the trees belong to the estate. They only take the fruits from mango, coconut and jak trees. If trees were to be affected, permission should be obtained from the estate management. Electricity lines should be erected far away from our line rooms. If lines crossed over our houses and land, it would be insecure for our lives. Our roofs are covered with tin sheets. If suddenly a line fell over the roofs, it would be disastrous to our lives. We have a lot of children and their lives will be in danger. We may not be able to use the produce from trees if they were cut down. Though we do not have our own houses now, our future generations may build houses or engage in cultivations. Then they will not have sufficient land to build houses. There are private lands adjoining the estate. Those people will not like losing their vegetation. CEB is interested only in accomplishing their tasks and not interested in our security and future concerns. When we tell our concerns, CEB does not listen to us. We have no problem if the lines were erected along the canal. It will little damage the environment and people will lose a few coconut trees. An officer from CEB should be available in the vicinity in case we need to complain any problems. As we think of the country's development, we also need to think of ourselves. The estate belongs to the Kegalle plantation company. For any crop and trees losses, the estate will have to be compensated. The estate has more than 500 acres in extent. If any losses caused to private land owners, they too have to be compensated. We need compensation not only for the lost trees and crops but also for the depreciation of land values due to lines crossing over our lands. There are 9 line quarters with over 100 rooms. Some rooms are occupied by non-labourer families as well. There are 5-6 small groceries. Public transport services are available every hour between Aththanagoda and Kegalle. The distance to Kegalle town is 8 km. For marketing purposes, people go to Kegalle. Around 40 households have private drinking water wells. Estate families have common wells. One well is shared by about 20 households. People go to the canal for bathing and washing purposes. During dry season, water in the canal is scarce and gets polluted.

289. Farmers may raise their objections if the line traverses across paddy fields in Velikandawatta. They should be paid compensation. Land values will decrease if electricity lines traversed over land. Even if it is a barren land people may not like to construct houses on such land. Compensation should take into consideration depreciation of such land values**.** There are about 350-400 households and they are equally divided between Sinhalese and Tamils. There is a dispensary, Hindu kovil and four retail groceries. This village has around 250-300

households with a population of around 2,000. The population includes Sinhalese and Tamils and Buddhists, Hindus and Christians. The estate laborers also include both ethnic communities. There had been marriages between Sinhalese and the Tamils. If we wanted to build a house, we have to get permission from the estate. Earlier, the estate gave some land plots (15 perches) to people and deducted its value from the wages of the labourers. Those families were given a permit. Some families have built houses closer to their line rooms. There are 2-3 families living in small line rooms and they are congested. Some of their family members work in Colombo and hardly come home because there is no adequate space for them to stay in the line room. Most of the Sinhalese households have their own private wells. The estate labourer households do not have private wells. Four to five households got together and constructed a common well in the upper section of the estate at their own expense.

Mahiyangana GS - Bibile 33 kV line

290. At Arawatta, villagers said that some time ago a person came and made observations in the area, but he did not discuss anything except to say that a new electricity line will cross over our area. We are not aware of the effects over us upon such lines and if they consider on us its effects on us, but if the line does not make any harm to us, we have no objection to the line. Loss of trees will be a great loss. Also, if we lose lands, our children will not have sufficient land to build houses in the future. Therefore, a fair compensation is expected for the trees and lands affected. Around 600 families live in the GN division and all are Sinhalese Buddhists. The only public places in the village are the community hall and the shrine room. The village has a Sunday school. There are three quarries owned by outsiders. The quarry workers are paid at LKR 400 per load of metal. Others work in the quarries to load the rocks to the crushers. There are 3 small grocery shops in Arawatta.

291. Maraketiya villagers said that they are not aware of this project. The project should not have any harmful effects on people's housing. We can bear the minor losses but should not damage trees. Expect reasonable cash compensation for any. There are 150 families live in the village and 500 families in the GN division. The only public place in the village is the community hall. People have to go to Rideemaliyadda to get services provided by the government.

292. At Gemunupura Akkara 30, villagers said that it's good to implement the project. But it should not harm the housing and crop lands of the villagers. The settlements in the village started with the Mahaweli development scheme. There are 600 Sinhala Buddhist families live in the village. There are 5 community centres, a samurdhi bank, several shops and 3 rice mills. People have wells in their home gardens.

Monaragala GS - Wellawaya 33 kV line

293. Veheragala villagers said that they were not aware of the project. They will object if the lines were erected over our lands and houses. What about the safety of the people? We specially question the safety of the people if this project was implemented. This should not destroy the trees and our houses. Fair compensation should be provided for the loss of land and housing. There are about 50 to 55 households. Population is about 250 to 300. All are Sinhalese Buddhists. The community hall was built by the funeral aid society. The nursery of the

rubber development board is the only government outlet. The total families in the village are 350 to 400 and the population exceeds 2000. Over 90% of the population is Sinhalese and many of them are Buddhists. Some of them are Christians. There is a small Muslim settlement in the village. A temple, the samurdhi bank, sugar company, distillery, Pelwatte dairy company are situated within or close proximity to the village. There are 4 large shops and 10 mall shops. No service stations are available, but in the sugar company premises banks and other services are available. Drinking water is available from wells and water supply lines of National Water Supply and Drainage Board (NWSDB)

Elpitiya- Mattaka 33 kV line

294. At Ketandola, villagers were not informed by the CEB. Does this project benefit the village directly? It is better if the lines go over the paddy land. We don't like if the lines went over our houses. It is not good that electricity lines are erected over our houses and land. Fair compensations should be provided for the loss of land losses and houses. There are 1,500 registered voters in Ketandola village. There are 600 households in the village. Of them, 300 are Tamil. Tamils have their own graveyard, but it is not used frequently. There are 20 retail shops, 2 hardware shops, one garment factory, a tea factory, a rubber factory, 2 salons, 2 auto garages, a timber mill and a welding workshop in the village. Most of the Sinhalese families own private wells. Estate quarters have a drinking water problem.

295. Rassanwila villagers said that they were informed by CEB officers who came to conduct initial surveys about the tower line project. The paddy fields do not have specific owners. Therefore, nobody will object if the electricity lines crossed over the paddy fields. Many people will not expect compensation since this is a development activity in the country. The GN division consists of 519 households. Rassanvila village has 39 households. One family is a Tamil family. Others are Sinhalese Buddhists. No common places in the village. It is a small village. Since it is closer to the main road, there are no shops in the village. Many have privately owned wells. Some use pipes to take water from up-streams. There are no drinking water issues.

Morawaka-Warukandeniya 33 kV line

296. The Happitiya villagers said the CEB officials visited the village two months ago. Proposed line path was observed. We were told that a new line will be erected. We have no problem with the line construction provided it does not harm our lands or housing. If it is a 33 kV line it will go over high. That will make many problems for us. But we don't know how others will object. In 2006, there were problems in the electricity supply. But after the construction of the mini-hydro power station at Happitiya the supply became better. Two storied house owners will object if the line went over their houses, because the line will be closer to the roof. People will object cutting down valuable trees. They should be compensated. If possible try to avoid houses when erecting the line. Sufficient compensation should be provided for people to buy new lands. Damages to the trees should also be compensated. There are about 400 to 500 households. Of them 10-20 families are Tamil. One Christian family is living in the village. Rest are Buddhists. A GN office, a Samurdhi office, a Sathosa cooperative store, a community hall, 10 retail shops, 4 hardware stores, 2 communication centers, 2 garages, 1 vehicle service station, 1 tea factory and a mini-hydro power station are in the village area. Happitiya junior school is situated in the

village. GN office is also a public place in the village. DS office is 8 km away from the village. Nearest hospital is the Neluwa Madagama hospital which is 9 km away from the village. Many villagers take water from mountain streams. This is done by blocking the up-stream through small weirs. The water is directed to a pipe and it distributes water to the downstream households. Few own private wells.

297. Alapaladeniya villagers said that they are aware of such a project. The proposed line is over paddy fields. Since lines don't go over houses there will be no objection. One family in the village owns many of the paddy fields. Farmers cultivate those lands on rent basis. Therefore, objections may come from the owners. The project should fairly compensate the people who lose assets due to the project. There are about 300 households in the village. Five Tamil families live in the Haliela estate of the village. Rest is mainly Sinhalese Buddhists. Alapaladeniya high School, midwifery center, community hall, GN office, 15 retail shops, 1 hardware shop, 1 timber shop, 1 salon, 1 sweet producing factory, 3 small scale tailoring shops, 2 vehicle repair garages and 2 gem mines are situated within the village. Every household has their own well.

VII. GRIEVANCE REDRESS MECHANISM

A. Awareness of Stakeholders

298. 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 tower line has gained a reasonable knowledge about the potential grievances, which will arise in the future.

299. 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.

300. The community should be informed about the Grievance Redress Mechanism (GRM), procedure for making complaints, including the place and the responsible person to contact is already established by the Public Utilities Commission of Sri Lanka (PUCSL). Almost all the stakeholders related to the GRM must be made 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 lines as attached in **Annex 7**.

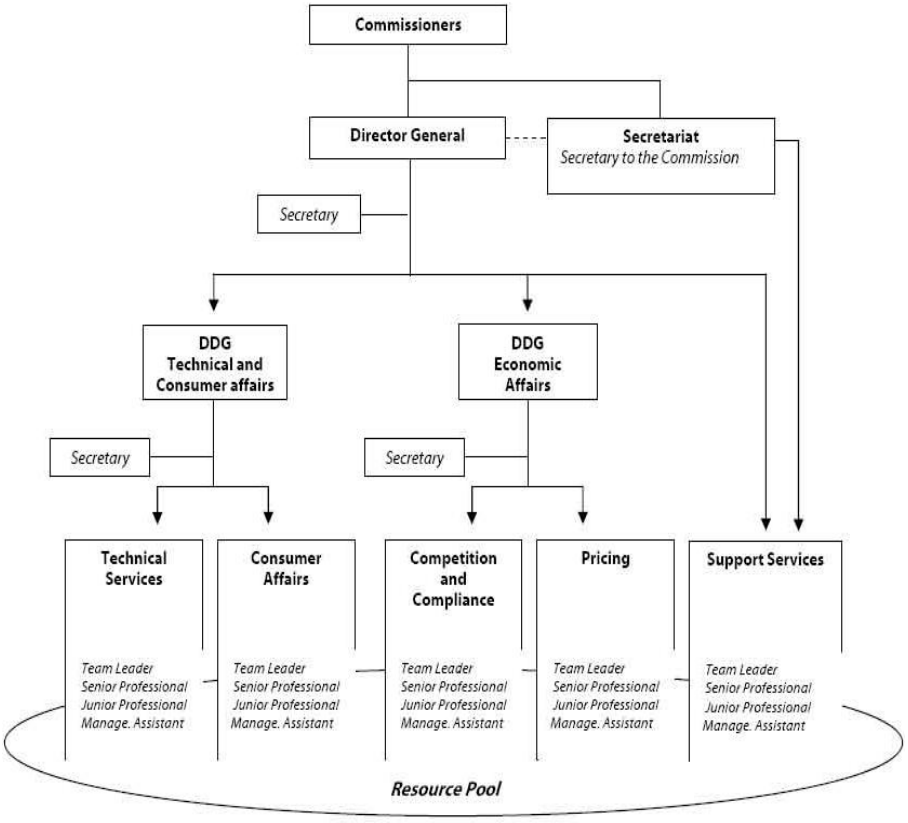
B. Grievance Redress Mechanism and PUCSL

301. 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. Thus, 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 10 depicts the PUCSL hierarchy.

302. 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.

303. 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 10: Responsibility Hierarchy of PUCSL



304. 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 29.

Table 29: 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

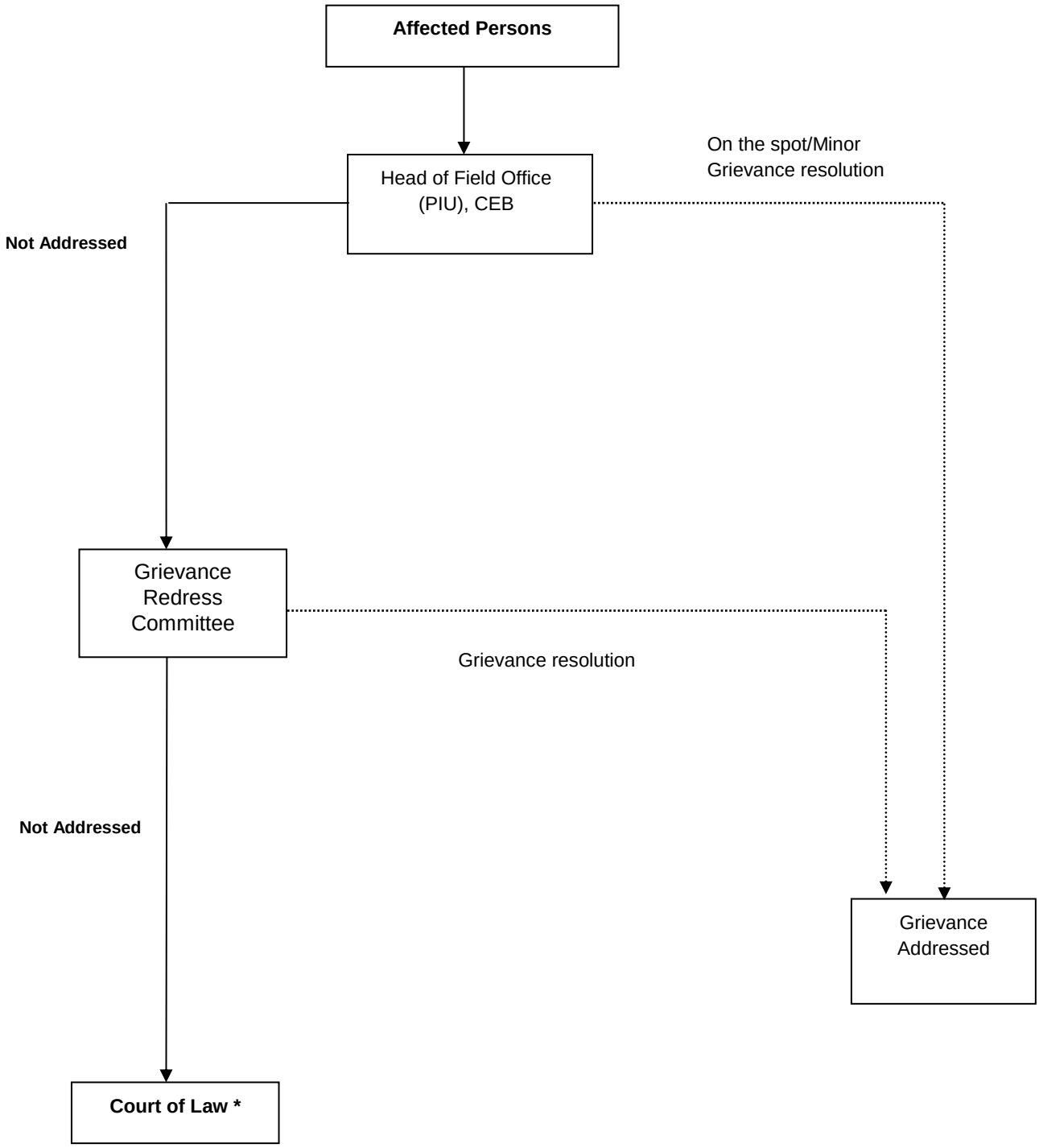
* (EPC) - Engineering, Procurement and Construction Contractor

305. This Grievance Redress Mechanism (GRM) would 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.

306. 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.

307. 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 11.

Figure 11: Flow chart showing Grievance Redress Mechanism



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

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Institutional Arrangements

308. According to 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. 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 generation projects. The Project Management Unit[6] 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.

309. PMU has designated Environment Officer of Energy and Environment Division (EED) who has oversight responsibilities for monitoring of all sub-projects in areas such as Environment, R&R and Social safeguards. To assist EED 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 EED in day-to-day coordination and reporting of various subproject activities.

310. The duties of the EED will include at a minimum: (i) oversight of field offices and construction contractors for monitoring and implementing mitigation measures; (ii) liaising with the field offices and contractors and seeking their help to solve the environment-related issues of subproject implementation; and (iii) preparation of environmental management reports every 6 months (as required by ADB). EED must coordinate with PIUs for monitoring as well as designing appropriate mitigation measures to address environmental and social issues[7].

311. The duties of the Environment Division 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 management 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.

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

[7] 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.

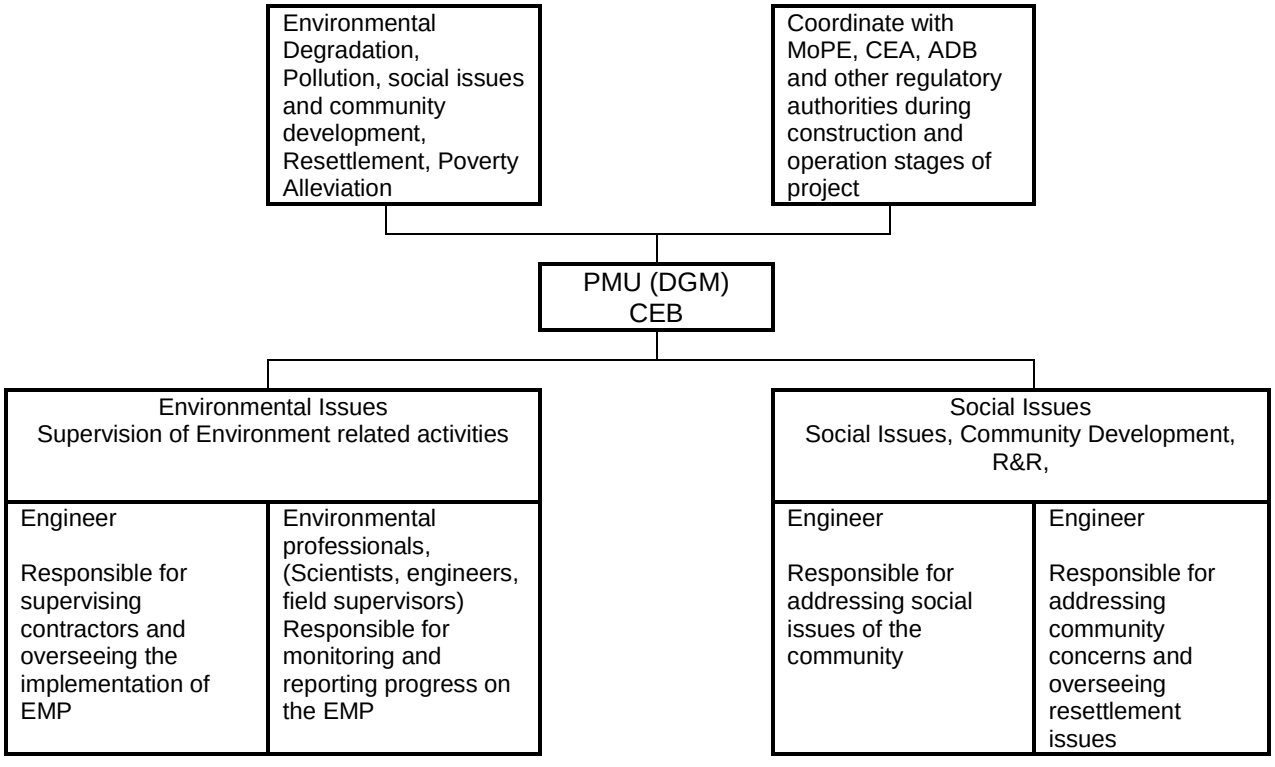
- Provide training and awareness on environmental and social issues related to power transmission projects to the project staff.

312. The duties of the Environment Division 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.
- 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.

313. The mitigation measures suggested require monitoring of environmental attributes both during construction and operational phase of the project. The Figure 12 below depicts the institutional organisation structure showing the various entities within CEB and their role vis-à-vis- other government agencies.

Figure 12: Institutional Structures and Responsibility for Environmental Management Plan at CEB



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

B. Monitoring of Environmental Management Plan (EMP)

314. The mitigation measures suggested require monitoring of environmental parameters - both during construction and operational phases of the project. The monitoring of the environmental aspects shall be ensured by EED. 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 impacts. This in turn should be monitored by the Project Manager of the individual tower line/gantry 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.

315. The EED will ensure that site engineers and contractors adhere 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**

316. 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 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 **Annex 6**.

- **Reporting**

317. 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. 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 half-yearly 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.

318. The EED after interaction with Project managers of PIUs will prepare and submit environmental 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 environmental 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. A sample Environmental report format is attached in **Annex 8**.

319. The implementation of the EMP measures should be dealt through the conditions of the contract. These conditions will regulate the actions for CEB to enhance environmental compliance. ADB will continue to monitor project compliance with ADB safeguard requirements on an on-going basis throughout the duration of the contract.

C. Environmental Management Plan Budget Costs

320. 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.

321. From the total project cost of USD 118.8 million, USD 1.7 million has been included as the Environmental Mitigation and Social issues (which includes EMP costs) as shown in Table 30. 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. compensation for private land and fruit/non-fruit trees for proposed ROW,
ii. compensation for crops in ROW and tower sites,
iii. cost of compensatory afforestation,
iv. cost for implementation of environmental mitigation measures, and
v. cost towards monitoring costs, independent audit costs for the project.

Table 30: Summary of Estimated Costs including for Environmental Monitoring Plan (million USD)

Item			LKR Million			USD million			
			Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost	% of Base Cost
A.	**Investment Costs a/**								
	1.	Turnkey contract	5,301.4	3,677.5	8,978.9	36.8	25.5	62.4	55%
	2.	Civil works and erection	0.0	1,363.7	1,363.7	0.0	9.5	9.5	8%
	3.	Mechanical and equipment	2,427.8	3,135.7	5,563.5	16.9	21.8	38.6	34%
	4.	Consultants							
		a. Project management, design and supervision			32.4	32.0	64.4	0.2	0.2
		Subtotal (A)	**7,761.6**	**8,208.8**	**15,970.3**	**53.9**	**57.0**	**110.9**	**98%**
B.	**Other Costs a/**								
	1.	Environment and social mitigation	0.0	248.9	248.9	0.0	1.7	1.7	2%

	2.	Training and Workshops	0.0	36.0	36.0	0.0	0.3	0.3	0%
	3.	Audit	0.0	4.3	4.3	0.0	0.0	0.0	0%
	4.	Salaries	0.0	84.9	84.9	0.0	0.6	0.6	1%
	4.	Communication	0.0	7.2	7.2	0.0	0.1	0.1	0%
		Subtotal (B)	**0.0**	**381.3**	**381.3**	**0.0**	**2.6**	**2.6**	2%
	Total Base Cost		**7,761.6**	**8,590.1**	**16,351.7**	**53.9**	**59.7**	**113.6**	**100%**
C.	**Taxes and Duties**		**2,718.1**	**990.8**	**3,708.9**	**18.9**	**6.9**	**25.8**	**23%**
D.	**Contingencies**								
	1.	Physical b/	524.0	479.0	1,003.0	3.6	3.3	7.0	6%
	2.	Price c/	542.3	1,319.9	1,862.2	3.3	7.8	11.2	10%
		Subtotal (D)	**1,066.3**	**1,798.9**	**2,865.1**	**7.0**	**11.2**	**18.1**	**16%**
E.	**Financing Charges During Implementation**								
	1.	Interest during implementation d/	979.7	0.0	979.7	5.8	0.0	5.8	5%
	2.	Commitment charges	44.7	0.0	44.7	0.3	0.0	0.3	0%
	3.	Front-end fees	0.0	0.0	0.0	0.0	0.0	0.0	0%
		Subtotal (E)	**1,024.4**	**0.0**	**1,024.4**	**6.1**	**0.0**	**6.1**	**5%**
Total Project Cost (A+B+C+D+E)			**12,570.4**	**11,379.8**	**23,950.1**	**85.8**	**77.7**	**163.5**	**121%**

Source: DPR reports from CEB # Consists of all EMP, Environmental Monitoring costs

D. Critical Environmental Review Criteria

(i) Loss of irreplaceable resources

322. The rural 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

323. 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

324. Very few endemic species of flora and fauna exist in the project sites and adjoining forest areas, but the project activities will not threaten or cause their extinction. This is because

all distribution projects are situated in man-modified habitats and undisturbed natural habitats are not found in proposed project sites. Habitats in the project area in the dry zone are not critical because in Sri Lanka elephants[8] often roam outside protected areas. There are many elephants in protected areas but they visit outside the protected areas mainly for food. But these areas are not critical habitat since the elephants only occasionally visit these human habitation.

(iv) Promoting undesirable rural-to urban migration

325. 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

326. The distribution 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.

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

IX. CONCLUTION AND RECOMMENDATIONS

327. In accordance with the ADB's Safeguard Policy Statement 2009, the proposed project is categorised as "Category B". Thus, a full Environmental Impact Assessments (EIA) for the project is not required. Distribution projects require land only for gantry based switching stations but do not require land for laying the tower lines. Wherever possible, the alignment is sited away from major settlements to account for future urban expansion. Natural forests areas and dense vegetation areas are avoided wherever possible; however, route alignment passes through scrublands, paddy fields, rubber plantations, tea cultivations etc. The lines will also pass through degraded forest areas but avoid any national park or sanctuary. The alignments have also avoided wetlands and geologically unstable areas, which can also pose foundation related problems. Land will only be purchased/acquired for gantry based switching stations but no land will be acquired for placing distribution towers on private land thereby avoiding any relocation of project affected people.

328. The proposed construction activities will not cause significant environment impacts and most of the potential environment impacts are temporary in nature mainly restricted to pre-construction and construction periods. The Environment Management Plan (EMP) and the Environment Monitoring Plan (EMoP) have been prepared and responsibilities for implementation have been assigned. The anticipated environmental impacts can be readily mitigated through the implementation of EMP.

329. Overall, the social and environmental impacts associated with distribution project 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.

330. Impacts are manageable and can be managed cost effectively - environmental impacts are likely to result from the proposed distribution system development. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for candidate 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 mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes.

331. The proposed project will have a number of positive and negative impacts on the existing environment. 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. In addition, electricity supply will help agricultural activities, students and public, increase land value, create lot of income generating activities, enhancement of safety at night, and increase mobility during night.

332. Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, nuisance from dust, noise, vehicle fumes, black smoke, vibration etc. due to construction activities are the short term negative impacts due to proposed project.

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

334. 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 distribution infrastructure. Overall, the major social and environmental impacts associated with distribution 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 condition of the project area. The environmental classification for the sub-project in four components is “Category B” and does not require an EIA.

Annex 1: 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 Ordinance (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 of land for public purpose.	It includes, among other matters: investigations for selecting land to be carried out 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.	Department of Valuation
Monuments and	An Act to provide for the	For the regulation of	Department of

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
Archaeological Sites and remains Act, 1958. Act Nº24 of 1958 Antiques Ordinance, 1960	preservation of ancient and historical monuments and archaeological sites and remains of national importance	archaeological excavations and for the protection of sculptures, carvings and other like objects etc.	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 Act (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 Act (Ambient Air Quality) Regulations, 1994.	To provide for the prevention and control of air pollution	Controls emissions of air pollutants	CEA
National Environmental Act (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; to implement energy efficiency measures and conservation programmes; to promote energy security	Reliability and cost effectiveness in energy delivery and information 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	Sri Lanka Sustainable Energy Authority

ASSESSMENT OF LEGAL AND INSTITUTIONAL FRAMEWORK

Sri Lankan Environmental Legislation

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 effected 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;
   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:
   iii. any erodable area declared under the Soil Conservation Act (Chapter 450)
   iv. 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.
   v. 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.
   vi. any reservation beyond the full supply level of a reservoir.
   vii. any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (Chapter 188).
   viii. any area declared under the Botanic Gardens Ordinance (Chapter 446).
   ix. within 100 meters from the boundaries of, or within, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (Chapter 469).
   x. 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.

xi. 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).

The requirement 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:

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.

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.

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[9]. An Environmental Protection License (EPL) from CEA, is required for the operation of the completed facilities (A list has been published by CEA).

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.

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[10] requires the permission and approval of the Director of Fisheries and Aquatic Resources (see the Fisheries and Aquatic

[9] 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."

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

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.

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.

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.

A summary of Government environmental compliance requirements applicable to the project is presented in **Table 1**.

Table 1: Summary of Environmental Compliance Requirements of the Project Components

	Subproject	Subcomponent	Applicable Legislation	Statutory Requirement	Authorizing Body
1.	New Tower 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	Hybrid renewable energy systems (comprising of Solar PV, Wind, Battery banks and diesel generators)	All subcomponents in sensitive areas	NEA	EC	CEA
		All subcomponents falling within the coastal zone	Coast Conservation Act	Clearance	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

	Subproject	Subcomponent	Applicable Legislation	Statutory Requirement	Authorizing Body
		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.

Table 2 summarizes the application procedures for the main environmental permits.

Table 2: Summary of Procedure for Obtaining Environmental Permits Required by the 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			
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 (Amendment) Act No. 24 of 1998; Gazette Notification No. 1152/14 dated 04.10.2000	Department of Archaeology	Proponent to submit application to Department of Archaeology.	During Feasibility Stage
		DA Regional Office to conduct Preliminary Observation and submit report to Department of Archaeology.	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

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
		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 activities will cause negative impacts on forest conservation areas and there will be extraction of resources involved.	30 days
		- 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.

APPLICABLE INTERNATIONAL ENVIRONMENTAL AGREEMENTS

In addition to national rules 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 are applicable for selection and screening of subprojects under restricted/sensitive areas. Sri Lanka is a party to these conventions.

A. 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.

B. Convention on Migratory Species of Wild Animals (CMS). CMS 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 aims 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.

C. 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.

D. 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.

E. 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.

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	08 575	1·34 970
Wind Pressure on Insulators	N/m2	12 865	1·62 1170
Wind Pressure on Lattice Steel Supports	N/m2	1·91 1370	2·25 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

Annex 2: Route Analysis for 33 kV lines

SN o.	Description	33 kV tower line Maho GS to Ma-Eliya gantry (24 km)	33 kV tower line Mallawapitiya GS to Rathmalgoda gantry (16 km)	33 kV tower line Kegalle/ Molagoda GS to Gevilipitiya gantry (11 km)	33 kV tower line Wimalasurendra GS to Maskeliya gantry (10 km)	33 kV tower line Mahiyanganaya GS to Bibile gantry (30 km)	33 kV tower line Monaragala GS to Wellawaya gantry (34 km)	33 kV tower line Elpitiya to Mattaka (11 km)	33 kV tower line Morawaka to Warukandeniya (18 km)
1.	Length of line	24 km	16 km	11 km	10 km	30 km	34 km	11 km	18 km
2.	Canal / River/ tank crossings	No river crossing, Hakwatuna oya/ stream crossing between MM15 and MM16 line crosses several seasonal tanks (Wewa)- Wilawa wewa (MM0-MM1), Imbulgodayagama wewa (AP2-AP3), Hangilipola wewa (AP4-AP5), Walaswewa (near MM8), Kadambawa wewa (near MM 9), Palugaskotuwa wewa (MM11-MM12), Wegedaragama wewa (MM12-MM13), Wanduressa Nelu Wewa (MM13-MM14)	No river crossing, line crosses a tank/ wewa between MR4 and MR6, Wendaru wewa	No	Kehelgamu Oya (WPS-1) Stream (11-12) Stream (14-15)	Canal (T17-T18), Tanks cross (T1-T2),(T11-T12)	Kumbukkan oya	No	No
3.	(i) Forest Area (in Hectare) (ii) Wild life Sanctuary/National Park (in Hectare) (iii) Distance from nearest Wildlife sanctuary/ National Park	None/ Not applicable	Not applicable	Not Applicable	Not applicable	None/ Not applicable	Yala National park	None/ Not applicable	Dellawa Forest Reserve
4.	Development of Tower site - Number of towers - Land to be acquired for tower base	19 angle towers, 51 suspension towers 6x6 m for suspension towers (0.24 ha) and 8x8 m for angle towers (0.92 ha)	25 angle towers, 42 suspension towers 0.16 ha for angle towers (8x8m), 0.15 ha for suspension towers (6x6 m)	41angle towers, 8suspension towers	21 angle towers, 11 suspension towers	120 angle towers, 23 suspension towers	118 angle towers, 26 suspension towers	29 angle towers, 15 suspension towers 0.19 ha for angle towers (8x8m), 0.05 ha for suspension towers	35 angle towers, 36 suspension towers 0.22 ha for angle towers (8x8m), 0.13 ha for suspension towers (6x6 m)

SN o.	Description	33 kV tower line Maho GS to Ma-Eliya gantry (24 km)	33 kV tower line Mallawapitiya GS to Rathmalgoda gantry (16 km)	33 kV tower line Kegalle/ Molagoda GS to Gevilipitiya gantry (11 km)	33 kV tower line Wimalasurendra GS to Maskeliya gantry (10 km)	33 kV tower line Mahiyanganaya GS to Bibile gantry (30 km)	33 kV tower line Monaragala GS to Wellawaya gantry (34 km)	33 kV tower line Elpitiya to Mattaka (11 km)	33 kV tower line Morawaka to Warukandeniya (18 km)
								(6x6 m)	
5.	Land Strata	Home gardens coconut lands, paddy fields, Mash, Water bodies. tanks, uncultivated areas	05 Paddy lands, Home garden, Mash, urban area & Water bodies	Paddy fields, Rubber plantations, Coconut plantations scrublands, Abandoned lands & Agricultural lands	02 paddy lands & home gardens, abounded lands, home gardens	Paddy fields, forests, scrublands, tanks, Abandoned lands & Agricultural lands	Paddy fields, 2ry forests, scrublands, tanks, home gardens	Paddy fields, Home gardens,	Paddy fields, Home gardens, Tea plantations
6.	Road accessibility	Nikaweratiya – Siyabalangamuwa Road (MM1) A'pura - Padeniya highway (MM3) Maho- Nagollagama road (MM7) Wagolla – Kalugalla road (MM17) Ibbagamuwa – Madagalla road (MM18)	Katugastota - Kunrunegala road (A10) - (AP-1- AP2) Ambepussa-Kurunegala-Trincomalee road (A6) -(AP23-24) Mallawapitiya-Rambodagalla road (B264) - (AP0-AP1), Mallawapitiya-Katupitiya road (AP2-AP3) Konpola-Dambepola road (AP6-AP7), Dambokka-Katupitiya Road (AP12-13) Attampitiya Road (AP14-AP15) Potuhera-Kuriyampola Road (AP15-16) Bulugolla-Dombemada-Wahawa Road (AP19-AP20) Hondella-Polpitiya Road (AP21-AP22)	Ambululugla Road, Kandewatta Road, Hettimulla-Ussapitiya Road Arawapola-Sudugala Road, Colombo-Kandy Highway	B71 - Carolina - Nortonbrige-Wanaraja road B149 - Hatton-Maskeliya-Dalhouse road	Kandy-Padiyathalawa highway, Peradeniya-Badulla-Chenkalady highway, Bibila-Uraniya-Mahiyangana Road Kotaganwella Road, Dambarawa lake road	Colombo-Batticaloa Highway, Silbara road, Maligawila Road, Badalkumbura-Buttala-Sellakatharagama Road and several miner roads	Ananda Vidyala Mawatha (B14) - (AP-1- AP2) Elpitiya –Pitagala road (B14) -(AP4-AP15) Galkadulla road - (AP16,AP17,AP18) Withanachchigoda road (AP19) Waduwatta road (AP20), Rassanwila Road (AP21) Pitigala-Mapalagama road (AP27) Ankutuwela Road (AP22-AP25) Apa Mawatha (AP26)	Morawaka- Neluwa road (B363) - (AP0-AP2-AP3-AP4-AP5-AP8-AP9-AP10-AP11) Thalapekubura road (AP7-) Dangala-Delwala road - (AP13-AP14-AP15), Dellawa road (AP20-AP21-AP22-AP25-AP33)

SN o.	Description	33 kV tower line Maho GS to Ma-Eliya gantry (24 km)	33 kV tower line Mallawapitiya GS to Rathmalgoda gantry (16 km)	33 kV tower line Kegalle/ Molagoda GS to Gevilipitiya gantry (11 km)	33 kV tower line Wimalasurendra GS to Maskeliya gantry (10 km)	33 kV tower line Mahiyanganaya GS to Bibile gantry (30 km)	33 kV tower line Monaragala GS to Wellawaya gantry (34 km)	33 kV tower line Elpitiya to Mattaka (11 km)	33 kV tower line Morawaka to Warukandeniya (18 km)
			Rathmalagoda road (AP23-AP24)						
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: a) Residential b) Non-Residential	(i) 22.4 ha paddy land (a) 4.35 ha home gardens (b)6.375 ha coconut plantations	(i) 22.4 ha paddy land 0.96 ha in abandoned land (a) 0.79 ha home gardens	(i)a)6.58 km home gardens 8.27 km paddy fields 1.21 km Tea & Coconut plantations (ii)3.19 km Rubber plantations	Agriculture 7.25 Home garden 2.80 (i)(a) 0.55 ha home gardens (b) 7.14 ha Tea lands	(i) 30.45 ha paddy land 3.25 ha in abandoned land (a) 16.11 ha home gardens	(i) 47.52 ha paddy land (a) 29.69 ha home gardens	(i)11.4 ha paddy fields (a) 3.54 ha home gardens	(i)15.435 ha paddy fields (a) 10.425 ha home gardens
8.	EHV Line Crossing	None	None	None	None	None	None	None	None
9.	HT line crossings	Yes (GSS-P1), (TAP3- TAP4) & (TAP4-Gantry)	132 kV line cross between (AP0-AP01), Two 33 kV line cross between (AP0-AP01), (AP01-AP02), (AP09-AP10), (AP11-AP12), (AP12-AP13) & (AP19-AP20)	Unable to get Information from Map	Yes, AP2-Gantry	Yes (AP27-AP28), (AP22-AP23), (AP20B-AP21), (AP19-AP20A), (AP18-AP19), (AP14-AP16), (Bowatta GS-AP01)	None	33 kV line cross between (AP18-AP19)	132 kv line cross between (AP0-AP01),
10.	No. of Forest Trees :- a) Trees to be felled b) Trees to be lopped	None	None	None	None	a) 10	a) 320 Teak trees	None	

11.	No. of private trees Fruit Trees: a) Trees to be felled b) Trees to be lopped (i) Non Fruit Trees: a) Trees to		a	b		a	b		a	b		a	b		a	b		a	b		a	b		a	b
		(i)	150	3	(i)	139	04	(i)	59	2	(i)			(i)	73	17	(i)	83		(i)	73		(i)	53	
		(ii)	45	11	(ii)	5	10	(ii)	675	5	(ii)	70		(ii)	173	7	(ii)	70		(ii)	53		(ii)	56	

SN o.	Description	33 kV tower line Maho GS to Ma-Eliya gantry (24 km)	33 kV tower line Mallawapitiya GS to Rathmalgoda gantry (16 km)	33 kV tower line Kegalle/ Molagoda GS to Gevilipitiya gantry (11 km)	33 kV tower line Wimalasurendra GS to Maskeliya gantry (10 km)	33 kV tower line Mahiyanganaya GS to Bibile gantry (30 km)	33 kV tower line Monaragala GS to Wellawaya gantry (34 km)	33 kV tower line Elpitiya to Mattaka (11 km)	33 kV tower line Morawaka to Warukandeniya (18 km)
	b) Trees to be lopped be felled								
12.	Length of line in mountainous area	None	None	None	None	None	None	None	None
13.	Length of line in coastal area	None	None	None	None	None	None	None	None
14.	Length of line in cultivated area	17.88 km (home gardens & agricultural lands	15.6 km (home gardens & agricultural lands)	12.22 km(home gardens & agricultural lands	5.13 km (home gardens & agricultural lands	31.04 km(home gardens & agricultural lands	33.33 km (home gardens & agricultural lands)	9.97 km (home gardens & agricultural lands)	17.24 km (home gardens & agricultural lands)
15.	Length of line in un-cultivated area	2.35 km	0.7 km	0.29 km	4.0 km	0.70 km	2.71 km	None	None
16.	Highest altitude en-route the line	120 m	158 m	431 m	1324 m	326 m	396 m	55 m	250 m
17.	Nearest distance from airport	82 km to Katunayaka Airport	51 km to Katunayaka Airport	56 km to Katunayaka Airport	72 km to Ratmalana Airport	86 km to Mattala Airport	48 km to Mattala Airport	34.3 km to Katunayaka Airport	83 km to Mattala Airport
18.	Distance from nearest religious or archaeological sites	100 m from Kadambawa Rajamaha Viharaya	0.12 km to Jamiuth Thaquwa Jumma Mosque (AP12-AP13)	50 m from Kovil	75 m to Nellur Kali Kali Kovil	0.03 km Hadabandaragama Dewala/ tempal	--	--	0.075m to Sri Gunananda Viharaya (AP 24 – AP25)
19.	Name of villages involved/Name of District	Maho, Wilawa,Balalla Nawagaththa Hangilipola, Kekunawa Dampelessagama Walaswewa Hinukwewa Konwegama Kadambawa Yatakalanegama Palugaskotuwa Metiyaggana Wetiyagedera Wegedaragama Karambe, Wanduressa Koruwawa Galtanwewa Milagoda	Mallawapitiya, Doratiyawa, Veherabenda, Dambepola, Chichthapaththela, Ganegoda, Damunugoda, Bogamuwa, Thiragama, Arambepola, Handugala, Pujapitiya, Rathmalgoda,	Kauduulla, Wekoladeniya, Karandupana watta, Kendadeniya, Attanagoda, Ambulugala, Kandewatta, Dangollawatta, Hapugahadolawatta, Galatara, Tammannagoda, Narangammana, Ambadeniyawatta, Gevilipitiya	Midford, Donnybrook, Glengarift Dandukelegala, Osberon , Clarvarson, Castelreagh, Dunkelo, Blair athol, Kuda Maskeliya	Mahiyanganaya, Dambarawa, Rambukyaya, Dehigolla, Thalpelayaya, Arawatta, Gemunupura, Nagadeepa project, Rideemaliyedda, Uva Tissa[ura, Mapakadawewa, Ihalabatuyaya, Andaulpotha, Uraniya, Dambagahawatta, Hepola, Hemagasmulla, Ratupasketiya, Isuru Uyana, Bibile	Monaragala, Talawa, Horombuwa, Kumbukkana, Makulawa, Kadurugasarawa, Puhulkotuwa, Buttala, Yuaganawa, Burutha Handiya, Mahasenpura, Kukuranpola road, Anapallama, Kotaweheragala yaya, Wellawaya	Ampitiya watta, Bogoda, Katandola, Thalgaspe, Gurugodalla, Pothuwilahena, Amugoda, Galkadolla, Amaragoda, Keralawatta, Rassanwila, Mattakbebila, Mattaka	Kalugalyaya, Kodikaragama, Jambugashena, Alapaladeniya, Eadandukitha, Dangala, Delgahaela, Kadihingala, Moragahahena, Pannimulla, Hakpitiya

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		Dematagala Indigolla Wagolla Maeliya/ Kurunegala district							
20.	Land to be permanently acquired: a) Area (in ha) b) Cost.	a) 0.04 ha for the Rathmalgoda gantry	None	None	None	None	None	None	None

Annex 3: Locational Analysis for 33 kV Gantry based switching stations

Description	Keeriyankalliya	Rathmalgoda	Ma-Eliya	Maskeliya	Uhana	Irakkandy	Kumuburupitiya	Wellawaya	Ella	Bibile	Warukandeniya	Mattaka	Morawaka
Land Details													
Area of land	0.0143 ha	0.0143 ha	0.0143 ha	0.0143 ha	0.03 ha	0.0143 ha	0.0143 ha	0.0143 ha	0.0143 ha	0.0143 ha	0.0143 ha	0.0143 ha	0.0143 ha
Slope/Plain Land	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain	Flat terrain
Approximate Amount of land cutting required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required
Owner Ship of land (Private / Govt. / Other)	Private	Private	Private	Private	Government/ CEB land	Govt.	Govt.	Govt.	Govt.	CEB land	Private	Govt.	Private
(i) Agriculture :- a) Irrigated b)Non – irrigated	None	None	None	None	None	None	None	None	None	None	None	None	None
(ii) Non - Agriculture/ Private Waste land / barren.	Degraded land near metal crusher	Land adjacent to paddy field	Coconut land	Degraded land belong to temple	Degraded land	Degraded land	Degraded land	Paddy land/ degraded	Tea land	CEB land at the depot	Land adjacent to road	Coconut land	Degraded land
(iii) House or Building: c) Residential d) Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential	Non – Residential
Distance from Nearest (With name)					0.02 km	0.01 km	1.40 km				0.17 km		
River (Name/Distance)													
Highway	A3	Kurunegala – Trinco highway	No highway near (Ibbagamuwa-madagalla road)	A7	A27	No highway near (Pulmuddei road)	No highway near (Trinco - Pulmuddei road)	A2	Ella – Kumbalwela highway		A17		
Forest Area	None	None	None	None	None	none	None	None	None	None	None	none	None
Village / town	Akkaraweli	Rathmalgoda	Balagolla wewa road	Kuda Maskeliya		Irrakkandi brigde	Kumburupitiya	Wellawaya	Kitalella		Happitiya	Mapalagama road	Kalugalyaya
Market/Area of Economic Activity	Paddy, Agriculture	Paddy, Agriculture	Coconut,Agriculture	Tea,Agriculture	Paddy, Agriculture	Paddy, Agriculture	Paddy, Agriculture	Paddy, Agriculture	Paddy, Agriculture	Paddy, Agriculture	Home gardens		
Road accessibility	Kiriyankalli – Andigama road	Ambepussa-Kurunegala road	Ibbagamuwa – Madagalla road	B149	A27	Pulmoddeo road	Pulmoddeo road	Colombo-Batticaloa road	Kitalella road	A5	B363	Mattaka – Bambarawana road	B363
EHV Line Passing Near By (Distance)	None	None	None	None	None	None	None	None	None	None	None	None	None
HT line Passing	Gantry												

Description	Keeriyankalliya	Rathmalgoda	Ma-Eliya	Maskeliya	Uhana	Irakkandy	Kumuburupitiya	Wellawaya	Ella	Bibile	Warukandeniya	Mattaka	Morawaka
Near By													
No. of Forest Trees :- c) Trees to be felled d) Trees to be lopped	None	None	None	None	None					None	None	None	None
No. of private trees	None	none	none	None						None	None	None	None
(ii) Fruit Trees: c) Trees to be felled d) Trees to be lopped		None	None	None	None					None	6	4	2
(iii) Non - Fruit Trees: c) Trees to be felled d) Trees to be lopped	None	None	None	None	None					None	8	None	2
Distance from mountainous area	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Distance from in cultivated area	0		0	0	0.08 km	0.05 km	0.52 km	0	0	0.10 km	0	0	0
Altitude of Gantry	31 ft	281 ft	395 ft	4283 ft	139 ft	23 ft	24 ft	605 ft	3512 ft	822 ft	311 ft	57 ft	291 ft
Nearest distance from airport	67.32 km to Katunayake	52.48 km to Katunayake	64.68 km to A'pura airport	77.42 km to Rathmalana	3.18 km tom Ampara airport	21.63 km to Tricomalle airport	26.54 km to Tricomalle airport	55.69 km to Weerawila airport	66.45 km to Mattala airport	96.77 km to Mattala airport	42 km to Koggala airport	35.36 km to Koggala airport	35.29 km to Koggala airport
Distance from nearest religious or archaeological sites		0.77 km to Rathmalgoda Raja Maha Viharaya	0.58 km to Siri Mangala Piriwena	2.37 km to Anglican Christ church warleigh Dickoya	1.0 Km to Sri Sudarshanarama temple	0.54 km to Irukandy Masjid		2.52 km to Pokunugama Temple	1.41 km to Ravana Ella temple	0.44 km to Bodirukkaramaya Temple		0.70km to a temple near Apamawatha (Pitigala – Mapalagama road)	0.62 km to Vijaya Piriwena

Annex 4: Inventorisation along the Tower lines

Table 4.1 Inventorisation of 33 kV tower line 16 km- Mallawapitiya GS to Rathmalagoda gantry

Angle point No		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 (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
0	1	0.33	0.001	Mallawpitiya	Kurunegala	1/0	36	0.49	Government & Private	Home gardens & paddy Fields (2 houses)	Kos	3
											Pol	8
											Tekka	1
											Ratadel	1
											Mango	1
1	2	0.39	0.05	Millawa	Kurunegala	1/0	36	0.58	Private	Paddy fields		0
2	3	0.64	0.03	Mallawapitiya	Kurunegala	1/2	108	0.96	Private	Home gardens & paddy fields	Pol	6
3	4	0.98	0.08	Wennaru wewa	Kurunegala	1/3	144	1.47	Private, Government	Paddy fields, Tank	Pol	3
4	5	0.69	0.13	Weherabenda, Doratiyawa	Kurunegala	1/2	108	1.03	Private Government	Paddy fields, Tank		0
5	6	1.07	0.01	Dambepola	Kurunegala	1/3	144	1.60	Private	Paddy fields & home gardens	Pol	12
6	7	0.76	0.01	Chiththapathela Konpola	Kurunegala	1/2	108	1.14	Private	Paddy fields,		0
7	8	0.50	0.05	Damuunugoda	Kurunegala	1/1	72	0.75	Private,	Home gardens, paddy field	Pol	10
8	9	0.25	0.04	Bogamuwa	Kurunegala	1/0	36	0.37	Private	paddy field		0
9	10	0.47	0.03	Bogamuwa	Kurunegala	1/1	72	0.70	Private	Home gardens, & paddy field (Bogamuwa school)	Pol	23
											Puwak	2
											Teak	1
10	11	0.98	0.00	Thiragama	Kurunegala	1/3	144	1.47	Private	Paddy fields & home gardens (1 house)	Pol	6
11	12	0.83	0.03	Thiragama	Kurunegala	1/2	108	1.24	Private	Paddy fields		0
12	13	1.33	0.03	Gammana	Kurunegala	1/4	180	1.99	Private	Paddy fields		0
13	14	0.45	0.08	Gammana	Kurunegala	1/1	72	0.67	Private	Paddy fields		0
14	15	0.71	0.04	Kadawara	Kurunegala	1/1	72	1.06	Private	Paddy fields		0
15	16	0.49	0.04	Kadawara	Kurunegala	1/2	108	0.73	Private	Paddy fields		0

16	17	0.69	0.06	Gammankanda	Kurunegala	1/2	108	0.03	Private	Paddy fields		0
17	18	0.28	0.01	Arambepola	Kurunegala	1/0	36	0.42	Private	home gardens	Pol	22
18	19	1.14	0.04	Handugala	Kurunegala	1/4	180	1.71	Private	Home gardens, Paddy fields		0
19	20	0.25	0.03	Koladiviyankada	Kurunegala	1/0	36	0.37	Private	home gardens	Pol	27
20	21	1.19	0.04	Hubathgamuwa	Kurunegala	1/4	180	1.78	Private	Paddy fields		0
21	22	1.03	0.03	Pujapitiya	Kurunegala	1/3	144	1.54	Private	Paddy fields, home gardens	Pol	12
22	23	0.58	0.02	Rathmalagoda	Kurunegala	1/1	72	0.87	Private	Paddy fields, Home gardens	Pol	6
23	24	0.42	0.11	Rathmalagoda	Kurunegala	2/1	108	0.63	Private	Paddy fields		0
											Total	144

Table 4.2: Inventorisation of 33 kV tower line Maho GS to Ma-Eliya gantry 24 km

Angel Point no		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 (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
MM1	MM2	1.32			Kurunegala	1/3	144	1.98	Private	Tank, paddy fields, Home gardens	Aricanut	60
											Halmilla	2
											Coconut	60
											Kotttan	1
											Del	1
											Jak	1
											Gansuriya	2
											Halabu	2
											Kohomba	1
MM2	MM3	0.19			Kurunegala	1/0	36	0.28	Government	Uncultivated area (line cross a road)		0
MR2a	MR2b	0.31			Kurunegala	1/0	36	0.46	Government	Uncultivated area		0
MR2b	MM3	0.33			Kurunegala	1/0	36	0.49	Private	Paddy fields		0
MM3	MM4	0.71			Kurunegala	1/1	72	1.06	Private	Tank, Home gardens(line cross A'pura - Padeniya highway)	Teak	16
											Kohomba	3
											Daminiya	1
											Ketakala	3
											Cashew	1
											Timbiri	1
											Milla	1
											Karaw	1
											Ehala	1
MM4	MM6	0.77			Kurunegala	1/1	72	1.15	Private	Home gardens	Coconut	15
											Mahogany	3
											Palmaira	1
											Kohomba	1
MM6	MM7	1.94			Kurunegala	1/5	180	2.91	Private	Paddy fields, Coconut plantation, uncultivated area (cross Maho Nagollagama road)	Maila	3
											Teak	8
											Kohomba	7
											Coconut	10
											Mango	8
											halmilla	1
											Mee	1
MM7	MM8	1.25			Kurunegala	1/3	144	1.87	Private	Paddy fields		0
MM8	MM9	0.24			Kurunegala	1/0	36	0.36	Private	Paddy fields (line cross a road)	Teak	1
											Kumbuk	1

MM9	MM10	2.27			Kurunegala	1/6	252	3.40	Private	Paddy fields, coconut plantation, tank, uncultivated area		0
MM10	MM11	1.16			Kurunegala	1/ 2	108	1.74	Private	Paddy fields, home gardens, uncultivated area		0
MM11	MM12	1.32			Kurunegala	1/3	144	1.98	Private	Paddy fields		0
MM12	MM13	1.12			Kurunegala	1/ 2	108	1.68	Private	Paddy fields, Coconut plantation	Coconut	32
											Cashew	5
											Halmilla	1
											Ketakala	1
MM13	MM14	2.25			Kurunegala	1/6	252	3.37	Private	Paddy fields, tank, Home gardens (line cross a road)		0
MM14	MM15	1.30			Kurunegala	1/3	144	1.95	Private	Paddy fields, Coconut plantation (line cross a road)		0
MM15	MM16	1.31			Kurunegala	1/3	144	1.96	Private	Paddy fields, coconut plantation	Coconut	10
MM16	MM17	4.32			Kurunegala	1/11	432	6.48	Private	Paddy fields, coconut plantation (line cross Hiripitiya – Galtamwewa road)		0
MM17	MM18	0.85			Kurunegala	2/2	108	1.27	Private	Paddy fields (line cross Wagolla – Kalugalla road)		0
											Total	178

Table 4.3: Inventorisation of 33 kV tower line- Wimalasurendra GS to Maskeliya Gantry 10 km

Angle point No		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 (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
0	1	0.57	0.01	Vidulipura	NuwaraEliya	1/1	72	0.86	Gov.	Scrubland	None	0
1	2	1.52	0.00	Wimalasurendra gama	NuwaraEliya	1/4	180	2.28		Tea land, road,	Toona	2
											Kasa	1
											Eucalyptus	18
											Aricanut	12
											Albizia	4
2	3	0.40	0.25	Bambaragala	NuwaraEliya	1/0	72	0.60		Tea land		0
3	4	0.70	0.23	Dandukelegala,	NuwaraEliya	1/1	108	1.05		Uncultivated scrubland, home gardens		0
4	5	0.20	0.12	Osborne	NuwaraEliya	1/0	36	0.30		Tea land		0
5	6	0.37	0.00	Osborne	NuwaraEliya	1/0	72	0.56		Tea land		0
6	7	0.42	0.14	Osborne	NuwaraEliya	1/0	72	0.63	Pvt	Tea land		0
7	8	0.30	0.03	Osborne	NuwaraEliya	1/0	36	0.45	Pvt	Tea land		0
8	9	0.76	0.03	Castlereagh	NuwaraEliya	1/1	108	1.14	Pvt	Tea land		0
9	10	0.29	0.09	Clarvarson	NuwaraEliya	1/0	36	0.44	Pvt	Tea land	Pinus	4
											Sabukku	1
											Bamboo	1
10	11	0.28	0.18	Castelreagh	NuwaraEliya	1/0	36	0.42		Young Eucalyptus plantation	Eucalyptus	15
11	12	0.21	0.35	Castelreagh	NuwaraEliya	1/0	36	0.32		Young Eucalyptus plantation	Eucaptus	12
12	13	0.34	0.40	Castelreagh	NuwaraEliya	1/0	72	0.51		Tea land		0
13	14	0.50	0.38	Castelreagh	NuwaraEliya	1/1	72	0.75		Tea land		0
14	15	0.63	0.39	Castelreagh	NuwaraEliya	1/1	72	0.95	Pvt	Abounded Tea land		0
15	16	0.30	0.59	Dunkeld	NuwaraEliya	1/0	36	0.45	Pvt	Tea land		0
16	17	0.29	0.06	Dunkeld	NuwaraEliya	1/0	36	0.44		Uncultivated land		0
17	18	0.53	0.09	Dunkeld	NuwaraEliya	1/1	72	0.80		Tea land		0
18	19	0.35	0.27	Norwood	NuwaraEliya	1/0	36	0.53	Pvt	Tea land		0
19	20	0.60	0.00	Kuda Maskeliya	NuwaraEliya	2/1	36	0.90	Pvt	Tea land/ uncultivated		0
												70

Table 4.4: Inventorisation of 33 kV tower line- Kegalle (Molagoda) GS to Gevilitpitiya Gantry 11 km

Angle point No		Distance between two towers/angle points/km	Approximate distance of transmission line from nearby Village/km	Name of Villages	Name of District	Number of Angle/suspension towers	Area of towers/m^2	Area under the ROW (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
1	2	0.11			Kegalle	1/0	36	0.16	Private	Home gardens	Jak	2
2	3	0.2			Kegalle	1/0	36	0.30	Private	Paddy fields		0
3	4	0.29			Kegalle	1/0	36	0.43	Private	Home gardens, Paddy fields (line cross Colombo Kandy Highway, line goes over few buildings)	Jak	1
4	6	0.61			Kegalle	1/1	72	0.91	Private	Home gardens, Tea land	Mara	2
6	7	0.22			Kegalle	1/0	36	0.33	Private	Home gardens	Jak	4
7	8	0.28			Kegalle	1/0	36	0.42	Private	Home gardens	Aricanut	4
											Rubber	6
8	9	0.29			Kegalle	1/0	36	0.43	Private	Tea land		0
9	10	0.2			Kegalle	1/0	36	0.30	Private	Home gardens	Aricanut	3
											Mahogany	1
10	11	0.38			Kegalle	1/0	36	0.57	Private	Coconut & Rubber plantations	Coconut	32
											Rubber	76
11	12	0.33			Kegalle	1/0	36	0.49	Private	Paddy fields		0
12	13	0.2			Kegalle	1/0	36	0.30	Private	Paddy fields		0
13	14	0.18			Kegalle	1/0	36	0.27	Private	Home gardens	Jak	1
											Del	1
14	15	0.19			Kegalle	1/0	36	0.28	Private	Home gardens	Alstonia	2
15	16	0.25			Kegalle	1/0	36	0.37	Private	Paddy fields		0
16	17	0.32			Kegalle	1/0	36	0.48	Private	Paddy fields		0
17	18	0.5			Kegalle	1/1	72	0.75	Private	Paddy fields		0
18	19	0.46			Kegalle	1/1	72	0.69	Private	Paddy fields(cross Ambulugala road)		0
19	20	0.38			Kegalle	1/0	36	0.57	Private	Paddy fields		0
20	21	0.36	0		Kegalle	1/0	36	0.54	Private	Paddy fields		0
21	22	0.38			Kegalle	1/0	36	0.57	Private	Home gardens	Jak	2
											Mara	1
											Aricanut	12
22	23	0.36			Kegalle	1/0	36	0.54	Private	Home gardens	Mango	1
23	24	0.74			Kegalle	1/1	72	1.11	Private	Paddy fields, Rubber plantations	Rubber	270
24	25	0.4			Kegalle	1/0	36	0.60	Private	Paddy fields		0
25	26	0.47			Kegalle	1 /0	36	0.70	Private	Paddy fields		0

26	27	0.37			Kegalle	1/0	36	0.55	Private	Paddy fields		0
27	29	0.38			Kegalle	1/0	36	0.57	Private	Paddy fields		0
29	30	0.38			Kegalle	1/0	36	0.57	Private	Home gardens	Mara	1
											Jak	1
30	31	0.19			Kegalle	1/0	36	0.28	Government	2ry forest	Na	3
31	32	0.29			Kegalle	1/0	36	0.43	Private	Home gardens	Clove	2
											Jak	2
32	33	0.47			Kegalle	1/1	72	0.70	Private	Home gardens	Mango	2
											Del	3
											Jak	4
											Mahogany	5
33	34	0.96			Kegalle	1/2	108	1.44	Private	Paddy fields, home gardens	Mahogany	1
											Mara	1
											Del	1
34	35	0.7			Kegalle	1/1	72	1.05	Private	Rubber plantation	Rubber	195
35	36	0.29			Kegalle	1/0	36	0.43	Private	Home gardens	Alstonia	3
											Jak	2
36	37	0.17			Kegalle	1/0	36	0.25	Private	Home gardens	Mara	1
											Mango	2
37	38	0.17			Kegalle	1/0	36	0.25	Private	Home gardens	Mahogany	4
											Lunumidella	1
38	39	0.43			Kegalle	1/0	36	0.64	Private	Rubber plantation	Rubber	80
39	40	0.19			Kegalle	1/0	36	0.28	Private	Paddy fields		0
40	41	0.35			Kegalle	2/0	72	0.52	Private	Home gardens	Jak	1
											Alstonia	2
												736

Table 4.5: Inventorisation of 33 kV tower line- Mahiyangana GS to Bibile gantry 30 km

Angle point No		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 (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
0	1	0.27			Badulla	1	36	0.40	Government	Tank ground		0
1	2	0.26			Badulla	1	36	0.39	Government	Tank		0
2	3	0.54			Badulla	1/1	36	0.81	Private	Home gardens	Coconut	3
											Jak	1
											Teak	4
3	4	0.18			Badulla	1	36	0.27	Government	Scrublands		0
4	5	0.22			Badulla	1	36	0.33	Private	Home gardens	Mango	1
											Coconut	1
5	6	0.23			Badulla	1	36	0.34	Private	Home gardens	Jak	2
											Nelli	1
6	7	0.20			Badulla	1	36	0.30	Private	Home gardens, paddy fields	Mara	1
											Coconut	1
7	8	0.20			Badulla	1	36	0.30	Government	2ry forest	Mara	3
8	9	0.21			Badulla	1	36	0.31	Government	2ry forest	Kithul	2
											Burutha	1
9	10	0.31			Badulla	1	36	0.46	Private	Paddy fields		0
10	11	0.36			Badulla	1	72	0.54	Government	2ry forest	Burutha	1
11	12	0.22			Badulla	1	36	0.33	Government	Tank		0
12	13	0.25			Badulla	1	36	0.37	Government	Tank grassland		0
13	14	0.16			Badulla	1	36	0.24	Private	Paddy fields		0
14	15	0.09			Badulla	1	36	0.13	Private	Paddy fields		0
15	16	0.12			Badulla	1	36	0.18	Private	Home gardens	Jak	1
											Mango	1
16	17	0.13			Badulla	1	36	0.19	Private	Home gardens	Jak	1
17	18	0.11			Badulla	1	36	0.16	Government	2ry forest (line passed a canal and bund road)	Teak	6
											Colon	1
											Mahogany	1
18	19	0.16			Badulla	1	36	0.24	Private	Home gardens, paddy fields (line cross a road)	Coconut	1
											Milla	1
19	20	0.22			Badulla	1	36	0.33	Private	Paddy fields		0
20	21	0.22			Badulla	1	36	0.33	Private	Paddy fields		0
21	22	0.50			Badulla	1/1	72	0.75	Private	Paddy fields		0
22	23	0.69			Badulla	1/1	108	1.03	Private	Paddy fields		0
23	24	0.45			Badulla	1/1	72	0.67	Private	Paddy fields		0
24	25	0.44			Badulla	1/1	72	0.66	Private	Paddy fields		0
25	26	0.30			Badulla	1	36	0.45	Private	Paddy fields		0
26	27	0.68			Badulla	1/1	108	1.02	Private	Paddy fields		0

27	28	0.47			Badulla	1/1	72	0.70	Private	Paddy fields		0
28	29	0.46			Badulla	1/1	72	0.69	Private	Paddy fields		0
29	30	0.35			Badulla	1	72	0.52	Private	Paddy fields		0
30	31	0.37			Badulla	1	72	0.55	Private	Paddy fields		0
31	32	0.38			Badulla	1	72	0.57	Private	Paddy fields		0
32	33	0.27			Badulla	1	36	0.40	Private	Paddy fields		0
33	34	0.23			Badulla	1	36	0.34	Private	Paddy fields		0
34	35	0.17			Badulla	1	36	0.25	Private	Paddy fields		0
35	36	0.15			Badulla	1	36	0.22	Private	Home gardens, paddy fields	Mahogany	1
											Tamarind	1
36	37	0.18			Badulla	1	36	0.27	Private	Home gardens	Jak	1
37	38	0.18			Badulla	1	36	0.27	Private	Home gardens, paddy fields	Rubber	20
											Coconut	1
38	39	0.21			Badulla	1	36	0.31	Private	Paddy fields		0
39	40	0.23			Badulla	1	36	0.34	Private	Paddy fields		0
40	41	0.21			Badulla	1	36	0.31	Private	Paddy fields		0
41	42	0.21			Badulla	1	36	0.31	Private	Paddy fields		0
42	43	0.28			Badulla	1	36	0.42	Private	Paddy fields		0
43	44	0.15			Badulla	1	36	0.22	Government	Marsh land		0
44	45	0.17			Badulla	1	36	0.25	Private	Home gardens	Coconut	1
											Jak	2
45	46	0.18			Badulla	1	36	0.27	Private	Paddy fields		0
46	47	0.15			Badulla	1	36	0.22	Private	Home gardens	Jak	1
47	48	0.16			Badulla	1	36	0.24	Government	2ry forest	Tamarind	1
48	49	0.17			Badulla	1	36	0.25	Private	Paddy fields		0
49	50	0.27			Badulla	1	36	0.40	Private	Home gardens, paddy fields	Rubber	44
											Milla	1
50	51	0.25			Badulla	1	36	0.37	Private	Home gardens	Jak	1
											Coconut	1
51	52	0.17			Badulla	1	36	0.25	Private	Home gardens, paddy fields	Kithul	1
											Mango	1
											Teak	1
52	53	0.30			Badulla	1	36	0.45	Private	Paddy fields		0
53	54	0.28			Badulla	1	36	0.42	Private	Paddy fields		0
54	55	0.28			Badulla	1	36	0.42	Private	Paddy fields		0
55	56	0.37			Badulla	1	72	0.55	Private	Paddy fields		0
56	57	0.30			Badulla	1	36	0.45	Private	Paddy fields		0
57	58	0.23			Badulla	1	36	0.34	Private	Paddy fields		0
58	59	0.24			Badulla	1	36	0.36	Private	Paddy fields		0
59	60	0.19			Badulla	1	36	0.28	Private	Paddy fields		0
60	61	0.35			Badulla	1	72	0.52	Private	Paddy fields		0
61	62	0.26			Badulla	1	36	0.39	Private	Paddy fields		0
62	63	0.14			Badulla	1	36	0.21	Private	Paddy fields		0
63	64	0.20			Badulla	1	36	0.30	Private	Home gardens, paddy fields	Teak	2
											Mahogany	1
64	65	0.27			Badulla	1	36	0.40	Private	Home gardens (cross Kataganwella road)	Mahogany	1
											Rubber	9
65	66	0.22			Badulla	1	36	0.33	Private	Paddy fields		0
66	67	0.26			Badulla	1	36	0.39	Private	Paddy fields		0
67	68	0.23			Badulla	1	36	0.34	Private	Paddy fields		0
68	69	0.26			Badulla	1	36	0.39	Private	Paddy fields		0

69	70	0.25			Badulla	1	36	0.37	Private	Paddy fields		0
70	71	0.26			Badulla	1	36	0.39	Private	Paddy fields		0
71	72	0.29			Badulla	1	36	0.43	Private	Paddy fields		0
72	73	0.12			Badulla	1	36	0.18	Private	Paddy fields		0
73	74	0.24			Badulla	1	36	0.36	Private	Paddy fields		0
74	75	0.18			Badulla	1	36	0.27	Private	Paddy fields		0
75	76	0.26			Badulla	1	36	0.39	Private	Home gardens, paddy fields	Jak	2
											Coconut	1
76	77	0.23			Badulla	1	36	0.34	Private	Paddy fields (line cross Bibila -Mahiyangana road)		0
77	78	0.29			Badulla	1	36	0.43	Private	Paddy fields		0
78	79	0.20			Badulla	1	36	0.30	Private	Paddy fields		0
79	80	0.23			Badulla	1	36	0.34	Private	Paddy fields		0
80	81	0.21			Badulla	1	36	0.31	Private	Paddy fields		0
81	82	0.21			Badulla	1	36	0.31	Private	Home gardens, paddy fields	Jak	1
											Teak	1
82	83	0.26			Badulla	1	36	0.39	Private	2ry forest	Kolon	2
83	84	0.23			Badulla	1	36	0.34	Private	Paddy fields		0
84	85	0.31			Badulla	1	72	0.46	Private	Paddy fields		0
85	86	0.31			Badulla	1	72	0.46	Private	Home gardens (line cross a road)	Ketakala	1
											Jak	1
86	87	0.35			Badulla	1	72	0.52	Private	Home gardens	Jak	1
											Mahogany	1
87	88	0.59			Badulla	1/1	72	0.88	Private	Coconut plantation	Coconut	15
88	89	0.54			Badulla	1/1	72	0.81	Private	Home gardens	Coconut	1
											Jak	2
89	90	0.44			Badulla	1/1	72	0.66	Private	Home gardens	Teak	2
											Jak	1
90	91	0.28			Badulla	1	36	0.42	Private	Home gardens	Rubber	13
91	92	0.24			Badulla	1	36	0.36	Private	Home gardens, paddy fields	Jak	1
92	93	0.22			Badulla	1	36	0.33	Private	Paddy fields		0
93	94	0.21			Badulla	1	36	0.31	Private	Paddy fields		0
94	95	0.29			Badulla	1	36	0.43	Private	Home gardens, paddy fields (line cross a road)	Coconut	1
											Jak	1
95	96	0.30			Badulla	1	36	0.45	Private	Paddy fields		0
96	97	0.43			Badulla	1/1	72	0.64	Private	Paddy fields		0
97	98	0.51			Badulla	1/1	72	0.76	Private	Paddy fields		0
98	99	0.43			Badulla	1/1	72	0.64	Private	Paddy fields, Coconut plantation	Coconut	5
99	100	0.44			Monaragala	1/1	72	0.66	Private	Coconut plantation	Coconut	18
100	101	0.44			Monaragala	1/1	72	0.66	Private	Home gardens (line cross a road)	Jak	1
101	102	0.50			Monaragala	1/1	72	0.75	Private	Home gardens, paddy fields	Mahogany	3
102	103	0.40			Monaragala	1/1	72	0.60	Private	Paddy fields		0
103	104	0.40			Monaragala	1/1	72	0.60	Private	Home gardens	Teak	6
											Coconut	1
104	105	0.48			Monaragala	1/1	72	0.72	Private	Home gardens	Jak	1
105	106	0.46			Monaragala	1/1	72	0.69	Private	Home gardens	Milla	1
106	107	0.56			Monaragala	1/1	72	0.84	Private	Home gardens	Teak	2
											Rubber	5
107	108	0.48			Monaragala	1/1	72	0.72	Private	Home gardens	Rubber	15

											Coconut	1
108	109	0.49			Monaragala	1/1	72	0.73	Government	2ry forest	Ketakala	1
109	110	0.46			Monaragala	1/1	72	0.69	Government	Forest	Teak	3
110	111	0.28			Monaragala	1	36	0.42	Government	2ry forest	Katu imbul	2
111	112	0.20			Monaragala	1	36	0.30	Private	Home gardens,	Jak	2
112	113	0.22			Monaragala	1	36	0.33	Private	Home gardens, paddy fields	Tamarind	1
113	114	0.28			Monaragala	1	36	0.42	Private	Home gardens,	Kithul	1
											Coconut	1
114	115	0.26			Monaragala	1	36	0.39	Private	Home gardens	Jak	1
											Teak	1
115	116	0.19			Monaragala	1	36	0.28	Private	Home gardens	Teak	8
116	117	0.11			Monaragala	1	36	0.16	Private	Ground area		0
117	118	0.26			Monaragala	1	36	0.39	Private	Home gardens (cross Badulla Chenkaladi highway	Jak	1
118	119	0.06			Monaragala	2	72	0.09	Private	Home gardens		0
												256

Table 4.6: Inventorisation of 33 kV tower line- Monaragala GS - Wellawaya gantry 34 km

Angle point No		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/ Susp. Towers	Area of towers/m^2	Area under the ROW (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
0	1	0.37			Monaragala	1/0	36	0.55	Forest	2ry Forest (cross Batticalo highway –A04)	Teak	205
1	2	0.19			Monaragala	1/0	36	0.28	Private	Paddy fields		0
2	3	0.10			Monaragala	1/0	36	0.15	Private	Paddy fields		0
3	4	0.13			Monaragala	1/0	36	0.18	Private	Paddy fields		0
4	5	0.18			Monaragala	1/0	36	0.27	Private	Paddy fields		0
5	6	0.12			Monaragala	1/0	36	0.18	Private	Paddy fields		0
6	7	0.12			Monaragala	1/0	36	0.19	Private	Paddy fields		0
7	8	0.25			Monaragala	1/0	36	0.37	Government	2ry forest	Teak	115
8	9	0.25			Monaragala	1/0	36	0.37	Private	Paddy fields		0
9	10	0.13			Monaragala	1/0	36	0.19	Private	Paddy fields		0
10	11	0.20			Monaragala	1/0	36	0.30	Private	Paddy fields		0
11	12	0.14			Monaragala	1/0	36	0.21	Private	Paddy fields		0
12	13	0.16			Monaragala	1/0	36	0.24	Private	Paddy fields		0
13	14	0.08			Monaragala	1/0	36	0.12	Government	Scrubland (cross a road)		0
14	15	0.04			Monaragala	1/0	36	0.06	Private	Paddy fields		0
15	16	0.09			Monaragala	1/0	36	0.13	Private	Paddy fields		0
16	17	0.12			Monaragala	1/0	36	0.18	Private	Paddy fields		0
17	18	0.56			Monaragala	1/1	72	0.84	Private	Home gardens	Coconut	2
											Jak	2
18	19	0.51			Monaragala	1/1	72	0.76	Private	Home gardens	Teak	16
19	20	0.47			Monaragala	1/1	72	0.70	Private	Home gardens	Hulanhik	1
											Coconut	4
20	21	0.54			Monaragala	1/1	72	0.81	Government	Scrubland	Damaniya	1
21	22	0.74			Monaragala	1/1	72	1.11	Private	Home gardens (cross Silbara road)	Mahagany	5
22	23	0.03			Monaragala	1/0	36	0.04	Private	Home gardens		0
23	24	0.34			Monaragala	1/0	36	0.51	Private	Home gardens	Coconut	5
											Jak	1

24	25	0.45			Monaragala	1/1	72	0.67	Government	Scrubland	Dan	1
25	26	0.40			Monaragala	1/0	36	0.60	Government	Scrubland		0
26	27	0.31			Monaragala	1/0	36	0.46	Government	Scrubland	Milla	1
27	28	0.31			Monaragala	1/0	36	0.46	Government	Scrubland (cross Maligawila road)		0
28	29	0.30			Monaragala	1/0	36	0.45	Private	Paddy fields		0
29	30	0.13			Monaragala	1/0	36	0.19	Private	Paddy fields		0
30	31	0.16			Monaragala	1/0	36	0.24	Private	Home gardens	Coconut	12
31	32	0.06			Monaragala	1/0	36	0.09	Private	Paddy fields		0
32	33	0.09			Monaragala	1/0	36	0.13	Private	Paddy fields		0
33	34	0.05			Monaragala	1/0	36	0.07	Private	Paddy fields		0
34	35	0.07			Monaragala	1/0	36	0.09	Private	Paddy fields		0
35	36	0.09			Monaragala	1/0	36	0.12	Private	Paddy fields		0
36	37	0.04			Monaragala	1/0	36	0.10	Private	Paddy fields		0
37	38	0.04			Monaragala	1/0	36	0.06	Private	Paddy fields		0
38	39	0.06			Monaragala	1/0	36	0.09	Private	Paddy fields		0
39	40	0.09			Monaragala	1/0	36	0.13	Private	Paddy fields		0
40	41	0.09			Monaragala	1/0	36	0.13	Private	Home gardens	Mango	3
											Coconut	2
41	42	0.10			Monaragala	1/0	36	0.15	Private	Home gardens	Coconut	3
42	43	0.14			Monaragala	1/0	36	0.21	Private	Home gardens	Jak	2
43	44	0.08			Monaragala	1/0	36	0.12	Private	Paddy fields		0
44	45	0.07			Monaragala	1/0	36	0.10	Private	Paddy fields		0
45	46	0.09			Monaragala	1/0	36	0.13	Private	Paddy fields		0
46	47	0.07			Monaragala	1/0	36	0.10	Private	Home gardens	Ketakala	1
47	48	0.10			Monaragala	1/0	36	0.15	Government	Scrubland	Mango	1
48	49	0.12			Monaragala	1/0	36	0.18	Government	Scrubland	Jak	1
49	50	0.09			Monaragala	1/0	36	0.13	Government	Scrubland	Tamarind	1
50	51	0.16			Monaragala	1/0	36	0.24	Government	Scrubland		0
51	52	0.16			Monaragala	1/0	36	0.24	Private	Paddy fields		0
52	53	0.22			Monaragala	1/0	36	0.33	Private	Paddy fields		0
53	54	0.14			Monaragala	1/0	36	0.21	Private	Paddy fields		0
54	55	0.13			Monaragala	1/0	36	0.19	Private	Paddy fields		0
55	56	0.17			Monaragala	1/0	36	0.25	Private	Paddy fields		0
56	57	0.19			Monaragala	1/0	36	0.28	Private	Paddy fields		0
57	58	0.16			Monaragala	1/0	36	0.24	Government	scrubland	Teak	2
58	59	0.18			Monaragala	1/0	36	0.27	Government	Scrubland		0
59	60	0.21			Monaragala	1/0	36	0.31	Government	Scrubland		0
60	61	0.28			Monaragala	1/0	36	0.42	Government	scrubland	Mahogany	3

61	62	0.24			Monaragala	1/0	36	0.36	Government	Scrubland	Coconut	3
62	63	0.30			Monaragala	1/0	36	0.45	Government	Scrubland	Aralu	1
63	64	0.18			Monaragala	1/0	36	0.27	Private	Paddy fields		0
64	65	0.16			Monaragala	1/0	36	0.24	Private	Paddy fields		0
65	66	0.19			Monaragala	1/0	36	0.28	Government	scrubland	Teak	3
66	67	0.16			Monaragala	1/0	36	0.24	Government	Scrubland		0
67	68	0.31			Monaragala	1/0	36	0.46	Private	Paddy fields		0
68	69	0.02			Monaragala	1/0	36	0.03	Government	Scrubland	Mahogany	2
69	70	0.59			Monaragala	1/1	72	0.88	Private	Paddy fields (cross a road)		0
70	71	0.26			Monaragala	1/0	36	0.39	Private	Paddy fields		0
71	72	0.59			Monaragala	1/1	72	0.88	Private	Paddy fields, home gardens (cross Buttala – Sellakataragama road)	Coconut	2
72	73	0.60			Monaragala	1/1	72	0.90	Private	Paddy fields		0
73	74	0.04			Monaragala	1/0	36	0.96	Private	Paddy fields		0
74	75	0.23			Monaragala	1/0	36	0.34	Government	scrubland		0
75	76	0.23			Monaragala	1/0	36	0.34	Private	Home gardens (cross a road)	Mango	2
76	77	0.23			Monaragala	1/0	36	0.58	Private	Home gardens	Jak	4
											Mango	2
77	78	0.22			Monaragala	1/0	36	0.33	Private	Paddy fields		0
78	79	0.22			Monaragala	1/0	36	0.33	Private	Home gardens	Coconut	5
											Teak	2
79	80	0.19			Monaragala	1/0	36	0.28	Private	Home gardens	Jak	2
80	81	0.33			Monaragala	1/0	36	0.49	Private	Home gardens	Coconut	3
											Mango	2
81	82	0.12			Monaragala	1/0	36	0.18	Private	Home gardens	Jak	1
82	83	0.10			Monaragala	1/0	36	0.15	Private	Home gardens	Mango	1
83	84	0.12			Monaragala	1/0	36	0.18	Private	Home gardens	Coconut	3
84	85	0.12			Monaragala	1/0	36	0.18	Private	Home gardens	Coconut	5
85	86	0.13			Monaragala	1/0	36	0.19	Private	Home gardens	Milla	2
											Teak	1
86	87	0.08			Monaragala	1/0	36	0.12	Private	Home gardens	Coconut	2
87	88	0.09			Monaragala	1/0	36	0.13	Private	Home gardens	Coconut	1
88	89	0.11			Monaragala	1/0	36	0.16	Private	Paddy fields (cross a road)		0
89	90	0.09			Monaragala	1/0	36	0.13	Private	Paddy fields		0
90	91	0.29			Monaragala	1/0	36	0.43	Private	Paddy fields		0
91	92	0.27			Monaragala	1/0	36	0.40	Private	Paddy fields		0
92	93	0.28			Monaragala	1/0	36	0.42	Private	Paddy fields		0

93	94	0.45			Monaragala	1/1	72	0.67	Private	Home gardens	Jak	1
											Coconut	1
94	95	0.52			Monaragala	1/1	72	0.78	Private	Paddy fields (cross a road)		0
95	96	0.44			Monaragala	1/1	72	0.66	Private	Paddy fields (cross a road)		0
96	97	0.48			Monaragala	1/1	72	0.72	Private	Paddy fields (cross a road)		0
97	98	0.37			Monaragala	1/0	36	0.55	Private	Paddy fields		0
98	99	0.57			Monaragala	1/1	72	0.85	Private	Paddy fields		0
99	100	0.36			Monaragala	1/0	36	0.54	Private	Paddy fields		0
100	101	0.30			Monaragala	1/0	36	0.45	Private	Paddy fields		0
101	102	0.09			Monaragala	1/0	36	0.13	Private	Paddy fields (cross a road)		0
102	103	0.33			Monaragala	1/0	36	0.49	Private	Paddy fields		0
103	104	0.39			Monaragala	1/0	36	0.58	Government	2ry forest	Mango	4
											Teak	13
104	105	0.49			Monaragala	1/1	72	0.73	Government	2ry forest	Teak	4
105	106	0.61			Monaragala	1/1	72	0.91	Private	Paddy fields (cross a road)		0
106	107	0.39			Monaragala	1/0	36	0.58	Private	Home gardens	Coconut	5
107	108	1.14			Monaragala	1/ 2	108	17.1	Private	Home gardens	Jak	2
108	109	0.91			Monaragala	1/ 2	108	13.65	Private	Paddy fields		0
109	110	1.00			Monaragala	1/ 2	108	15.0	Private	Paddy fields		0
110	111	0.34			Monaragala	1/0	36	0.51	Government	scrubland		0
111	112	0.45			Monaragala	1/1	72	0.67	Private	Paddy fields		0
112	113	0.49			Monaragala	1/1	72	0.73	Private	Paddy fields		0
113	114	0.37			Monaragala	1/0	36	0.55	Private	Paddy fields		0
114	115	0.29			Monaragala	1/0	36	0.43	Private	Home gardens (cross a road)	Teak	4
115	116	0.52			Monaragala	1/1	72	0.78	Private	Paddy fields		0
116	117	0.43			Monaragala	1/0	36	0.64	Private	Paddy fields		0
117	Gantry	0.49			Monaragala	2/1	108	0.73	Private	Paddy fields		0
												473

Table 4. 7: Inventorization of 33 kV distribution line Elpitiya -Mattaka gantry 11 km/

Angle point No		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 (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
0	1	0.05	0.06	Ampitiya watta	Galle	1/0	36	0.07	Private	Paddy fields	No trees	0
1	2	0.6	0.06	Ampitiya watta	Galle	1/1	72	0.9	Private	paddy fields ,home gardens(cross Awittawa road)	Coconut	3
											Kithul	1
2	3	0.21	0.12	Awittawa Rd,Alpitiya	Galle	1/0	36	0.31	Private	paddy fields, home gardens	Coconut	3
											Aricanut	2
											Kaduru	1
											Bamboo	1
											Kenda	1
3	4	0.13	0.09	Bogoda	Galle	1/0	36	0.19	Private	paddy fields, home gardens	Coconut	3
											Bamboo	1
4	5	0.11	0.07		Galle	1/0	36	0.16	Private	paddy fields(cross Elpitiya-Pitigala road)	No trees	0
5	6	0.56	0.01	Katandola	Galle	1/ 1	72	0.84	Private	(edge of paddy fields)	No trees	0
6	7	0.69	0.04	Katandola	Galle	1/ 2	108	1.03	Private	paddy fields, home gardens	Kithul	3
											Young coconut	3
7	8	0.22	0.04	Katandola	Galle	1/0	36	0.33	Private	paddy fields(line goes near a house)	Kaduru	1
8	9	0.20	0.03	Thalpaspe	Galle	1/0	36	0.30	Private	Home gardens	Kotta	1
											Del	1
											Coconut	1
9	10	0.50	0.03	Gurugodalla, Thalgaspe	Galle	1/1	72	0.75	Private	Home gardens, paddy fields	Coconut	4
											Aricanut	8

											Oil palm	3
											Mango	1
											Kotta	1
											Mara	3
											Rambutan	3
											Rubber	12
											Jak	2
											Alstonia	7
10	11	0.19	0.02	Katandola	Galle	1/0	36	0.28	Private	Home gardens, paddy fields	Coconut	1
											Lunumidella	1
											Mara	2
11	12	0.14	0.01	Mananahena handiya	Galle	1/0	36	0.21	Private	paddy fields(main road/240v line/telephone line cross ,near a gantry	Oil palm	3
											Bamboo	1
12	13	0.18	0.02	Pothuwilahena, Thalgaspe	Galle	1/0	36	0.27	Private	paddy fields, home gardens (near Thalgaspe Vidyalaya	Coconut	1
											Kithul	1
											Rambutan	1
											Jak	1
13	14	0.16	0.05	Talgaspe	Galle	1/0	36	0.24	Private	paddy fields	no trees	0
14	15	0.10	0.04	Pitigala road	Galle	1/0	36	0.15	Private	paddy fields, home gardens(cross 240v/telephone lines, cross the B14 road)	Kenda	1
											Del	1
											Jak	1
											Mango	1
											Bamboo	1
											Coconut	7
											Amberella	1
15	16	0.45	0.07	Amugoda,Galkadolla	Galle	1/1	72	0.67	Private	Home gardens, paddy fields(cross Galkadulla road)	Coconut	3
											Halmilla	1
											Rubber	1
											Rambutan	1
											Jak	1
16	17	0.40	0.09	Galkadolla	Galle	1/1	72	0.60	Private	paddy fields, home gardens(cross the road)	Jak	1
											Lunumidella	1
											Milla	1
											Coconut	2
											Rubber	1
											Mangose	1
											Rambutan	7
17	18	0.26	0.03	Amaragama,amugoda	Galle	1/0	36	0.39	Private	paddy fields(cross Galkadulla road)	Coconut	3

18	19	0.27	0.04	Porawagama road	Galle	1/0	36	0.40	Private	paddy fields(cross 33kv/240v lines, cross main road	No trees	0
19	20	0.91	0.09	Withanachchigoda para,Keralawatta	Galle	1/3	144	1.36	Private	paddy fields, home gardens (line goes near a house, cross two roads(Withanachchigoda road/Waduwatta road	Coconut	1
20	21	0.17	0.08	Rassanwilla	Galle	1/0	36	0.25	Private	paddy fields(cross Rassanwila road)	No trees	0
21	22	0.47	0.05	Rassanwilla	Galle	1/1	72	0.70	Private	paddy fields, home gardens(cross a road)	Jak	1
											Kithul	2
											Coconut	3
											Kumbuk	1
22	23	0.21	0.03	Rassanwilla	Galle	1/0	36	0.31	Private	paddy fields, home gardens(cross a road)	Jak	2
											Coconut	1
											Mahogani	2
											Alstonia	1
23	24	0.49	0.03	Maththakbabila	Galle	1/1	72	0.73	Private	paddy fields, home gardens(line goes near a house, cross 240v line, cross a road)	Alstonia	5
											Jak	1
											Mahogani	1
											Coconut	1
24	25	0.16	0.05	Maththakbabila	Galle	1/0	36	0.24	Private	paddy fields, home gardens(cross a road)	Alstonia	2
											Albizia	1
25	26	0.76	0.05	Ankutuwela road	Galle	1/ 2	108	1.14	Private	paddy fields, home gardens(line cross a road)	Coconut	2
											Rubber	2
26	27	0.18	0.10	unable to access	Galle	1/0	36	0.27	Private	paddy fields		
27	28	0.48	0.10	Mapalagama road,Mattaka	Galle	2/1	36	0.72	Private	home gardens, paddy fields	Coconut	4
											Total	152

Table 4.8: Inventorisation 33 kV distribution line- Morawaka to Warukandeniya gantry

Angle point No		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 (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number of trees to be felled	
from	to											
0	1	0.48	0.10	Kalugalyaya, Morawaka-Neluwa road(B363) Morawaka	Matara	1/1	72	0.75	Private	Paddy fields (cross two 33kv,133kv lines, cross a road, line close to a house)	Kumbuk	1
											Jak	1
											Coconut	4
											Arica nut	3
1	2	0.80	0.11	Kodikaragama	Matara	1/2	108	1.20	Private	Paddy fields, home gardens	Jak	1
2	3	0.46	0.04	Kodikaragama	Matara	1/1	72	0.69	Private	Paddy fields, home gardens	Mora	1
3	4	0.54	0.06	Kodikaragama	Matara	1/1	72	0.81	Private	Paddy fields(cross 240v line, close to a house)	Bamboo	1
4	5	0.20	0.11	Kodikaragama	Matara	1/0	36	0.30	Private	Paddy fields, home gardens	Bamboo	2
											Coconut	1
5	6	0.50	0.06	Kodikaragama (Neluwa - Morawaka road)	Matara	1/1	72	0.75	Private	Paddy fields, home gardens(cross 33kv/240v/telephone lines, cross the road, line goes near a house)	Arica nut	3
											Coconut	6
											Jak	1
											Kithul	2
											Alstonia	4
6	7	0.86	0.09	Jambugashena	Matara	1/2	108	1.29	Private	Paddy fields, home gardens	Albizia	2
											Rubber	2
7	8	0.82	0.04	Alapaladeniya, Haldola road	Matara	1/2	108	1.23	Private	Paddy fields	No trees	0
8	9	1.04	0.05	Alapaladeniya	Matara	1/3	144	1.56	Private	Paddy fields, home gardens(cross 33kv/240v lines, cross Neluwa-Morawaka road, line close to a house)	Arica nut	2
											Pulun	1
9	10	1.09	0.03	Eedadukitha	Matara	1/3	144	1.63	Private	Paddy fields, home gardens,(near Eedadukitha primary school)	Coconut	3
											Arica nut	3
10	11	0.51	0.09	Eedadukitha	Matara	1/1	72	0.76	Private	Paddy fields, home gardens (cross 33kv/240v lines, cross the road, line goes between two houses)	Coconut	12
											Mango	1
											Arica nut	2
11	12	0.74	0.07	Dangala	Matara	1/2	108	1.11	Private	Paddy fields, home gardens(cross 33kv/240v line, cross the road)	Coconut	2
											Mango	1
											Mora	1
12	13	0.32	0.01	Not seen	Matara	1/1	72	0.48	Private	Home gardens		

13	14	0.12	0.1	Not seen	Matara	1/0	36	0.18	Private	Home gardens		
14	15	1.10	0.08	Delgahaela	Matara	1/3	144	1.65	Private	Home gardens	Kithul	2
											Mahogany	2
15	16	0.50	0.03	Delgahaela	Matara	1/1	72	0.75	Private	Home gardens(cross 33kv/240v lines, Dangala-Millawa road)	Coconut	5
											Arica nut	4
16	17	0.57	0.22	Not seen	Matara	1/1	72	0.85	Private	Home gardens		
17	18	0.97	0.09	Not seen	Matara	1/3	144	1.45	Private	Home gardens		
18	19	0.27	0.09	Not seen	Matara	1/0	36	0.40	Private	Home gardens		
19	20	0.85	0.08	Not seen	Matara	1/2	108	1.27	Private	Home gardens		
20	21	0.11	0.15	Not seen	Matara	1/0	36	0.16	Private	Home gardens		
21	22	0.11	0.03	Not seen	Matara	1/0	36	0.16	Private	Home gardens		
22	23	0.39	0.01	Not seen	Matara	1/1	72	0.58	Private	Home gardens		
23	24	0.12	0.05	Not seen	Matara	1/0	36	0.18	Private	Home gardens		
24	25	0.19	0.04	Kadihingala	Matara	1/0	36	0.28	Private	Paddy fields, home gardens(line goes near Sri Gunananda Viharaya)	Del	1
											Mango	1
											Rubber	1
											Alstonia	1
25	26	0.41	0.02	Kadihingala	Matara	1/1	72	0.61	Private	Home gardens(cross 33kv/240v lines)	Kithul	1
											Mara	1
26	27	0.41	0.08	Moragahahena,pannimulla	Matara	1/1	72	0.61	Private	Home gardens(line goes above few houses)	Jak	2
											Albizia	2
											Alstonia	1
											Kithul	2
27	28	0.18	0.07	Pannimulla	Matara	1/0	36	0.27	Private	Home gardens (near a house)	Jak	1
28	29	0.26	0.05	Pannimulla	Matara	1/0	36	0.39	Private	home gardens(line goes between 2 houses)	Alstonia	3
											Arica nut	2
											Jak	1
29	30	0.36	0.02	Happitiya	Matara	1/1	72	0.54	Private	Paddy fields, home gardens	Coconut	1
											Albizia	2
											Kithul	2
30	31	0.57	0.09	Happitiya	Matara	1/1	72	0.85	Private	paddy fields, home gardens	Gorok	1
											Jak	1
											Arica nut	3
31	32	0.58	0.20	Udawela road	Matara	1/1	72	0.87	Private	paddy fields, home hardens(line goes near a house)	Del	1
											Coconut	1
											Rambutan	1
32	33	0.23	0.03	Happitiya	Matara	1/0	36	0.34	Private	home gardens	Kithul	4
											Jak	2
33	34	0.14	0.06	Happitiya	Matara	2/0	72	0.21	Private	home gardens(line goes near a house)	Jak	2
											Alstonia	1
											Kithul	1
											Total	119

Table 4.9: Summary of the description for Mallawapitiya GS-Rathmalgoda 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	16 km
2.	Canal / River crossings	None, line crosses a tank/ wewa between MR4 and MR6, Wennaruwa wewa
3.	(i) Forest/ scrublands Area (ha)	(i) None
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Not applicable
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 25, Suspension Towers- 42 0.16 ha for angle towers (8x8m), 0.15 ha for suspension towers (6x6 m)
5.	Land Strata	Paddy fields, Home gardens, tank
6.	Road accessibility	Katugastota - Kunrunegala road (A10) - (AP-1- AP2) Ambepussa-Kurunegala-Trincomalee road (A6) -(AP23-24) Mallawapitiya-Rambodagalla road (B264) - (AP0-AP1), Mallawapitiya- Katupitiya road (AP2-AP3) Konpola-Dambepola road (AP6-AP7), Dambokka-Katupitiya Road (AP12-13) Attampitiya Road (AP14-AP15) Potuhera-Kuriyampola Road (AP15-16) Bulugolla-Dombemada-Wahawa Road (AP19-AP20) Hondella-Polpitiya Road (AP21-AP22) Rathmalagoda road (AP23-AP24)
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: Residential Non-Residential	(i) 22.4 ha paddy land 0.96 ha in abandoned land (a) 0.79 ha home gardens
8.	220 kV/132 kV transmission line crossing	132 kV line cross between (AP0-AP01),
9.	33 kV/11 kV line crossings	Two 33 kV line cross between (AP0-AP01), (AP01-AP02), (AP09-AP10), (AP11-AP12), (AP12-AP13) & (AP19-AP20)
10.	Road crossing	Mallawapitiya-Rambodagalla road (B264) - (AP0-AP1), Mallawapitiya- Katupitiya road (AP2-AP3) Konpola-Dambepola road (AP6-AP7), Dambokka-Katupitiya Road (AP12-13) Attampitiya Road (AP14-AP15) Potuhera-Kuriyampola Road (AP15-16) Bulugolla-Dombemada-Wahawa Road (AP19-AP20) Hondella-Polpitiya Road (AP21-AP22) Rathmalagoda road (AP23-AP24)
11.	National Highway/Major road Crossing	Katugastota - Kunrunegala road (A10) - (AP-1- AP2) Ambepussa-Kurunegala-Trincomalee road (A6) -(AP23-24)
12.	Telephone line crossing	TP line crossing at (AP0-AP01), (AP01-AP02),(AP12-13), (AP19-20)
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- (a) Trees to be felled (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.

Sr. No	Description	Option 1
15.	No. of private trees (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	 1 Mango tree, 3 Jak trees 135 Coconut trees 5
16.	Length of line in (a) marshy area (b) water bodies	 (b) 1.01 km
17.	Length of line in paddy /agricultural area	15 km
18.	Length of line in home garden area	0.6 km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(a) 0.7 km (b) none
20.	Highest altitude en-route the line	158 m near AP 9
21.	Nearest distance from coast/port and airports	54 km to the coast 51 km to Katunayake Air port
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious ~~or Archaeological~~ sites	0.12 Km to Jamiuth Thaquwa Jumma Mosque (AP12-AP13)
24.	Name of villages involved/ Name of Province	Mallawapitiya, Doratiyawa, Veherabenda, Dambepola, Chichthapaththela, Ganegoda, Damunugoda, Bogamuwa, Thiragama, Arambepola, Handugala, Pujapitiya, Rathmalgoda, North Western province
25	Land to be permanently acquired: Area (in ha) Cost.	0.04 ha for the gantry at Rathmalgoda

Table 4.10: Summary of the description for Maho GS to Ma-Eliya 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	24 km
2.	Canal / River crossings	None, line crosses tanks/ wewa between MM1-MM2, MM3-MM4, MM9-MM10
3.	(i) Forest/ scrublands Area (ha)	(i) Yes
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Not applicable
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 19, Suspension Towers- 51 0.16 ha for angle towers (8x8m), 0.15 ha for suspension towers (6x6 m)
5.	Land Strata	Paddy fields, Home gardens, tanks, coconut plantations, uncultivated areas
6.	Road accessibility	Nikaweratiya – Siyabalangamuwa Road (MM1) A'pura - Padeniya highway (MM3) Maho- Nagollagama road (MM7) Wagolla – Kalugalla road (MM17) Ibbagamuwa – Madagalla road (MM18)
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building:	(i) 22.4 ha paddy land (a) 4.35 ha home gardens (b)6.375 ha coconut plantations

Sr. No	Description	Option 1
	Residential Non-Residential	
8.	220 kV/132 kV transmission line crossing	No
9.	33 kV/11 kV line crossings	(GSS-P1), (TAP3- TAP4) & (TAP4-Gantry)
10.	Road crossing	A'pura - Padeniya highway cross between MM3- MM4 Maho - Nagollagama road cross between MM6 – MM7 Hiripitiya – Galtam wewa road cross between MM16 –MM17 Wagolla – Kalugalla road cross between MM17 – MM18
11.	National Highway/Major road Crossing	A'pura - Padeniya highway cross between MM3- MM4
12.	Telephone line crossing	
13.	Length of line passing in the forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- (a) Trees to be felled (b) Trees to be lopped	The line passes through home gardens, paddy fields, tanks & coconut plantations. No forest trees are found, only the few trees in coconut plantations, home gardens and uncultivated areas.
15.	No. of private trees (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	(1) 8 Mango trees, 1 Del tree, 1 Jak tree, 7 Cashew trees, 133 Coconut trees (2) 45 trees
16.	Length of line in (a) marshy area (b) water bodies	(b) 1.01 km
17.	Length of line in paddy /agricultural area	10.49 km 4.49 km in coconut plantations
18.	Length of line in home garden area	2.9 km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(a) 1.89 km (b) 0.46 km
20.	Highest altitude en-route the line	120m near MM18
21.	Nearest distance from coast/port and airports	49.12 km to the coast 82.16 km to Katunayake Air port
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious ~~or Archaeological~~ sites	
24.	Name of villages involved/ Name of Province	North Western province
25	Land to be permanently acquired: Area (in ha) Cost.	

Table 4.11: Summary of the description for Wimalasurendra GS to Maskeliya Gantry 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	10 km
2.	Canal / River crossings	Kehelgamu Oya (WPS-1) Stream (11-12) Stream (14-15)

Sr. No	Description	Option 1
3.	(i) Forest/ scrublands Area (ha)	(ii) None
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Within 1 km no any protected areas
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 19, Terminal towers- 02 Suspension Towers 11 2.61 ha
5.	Land Strata	Tea lands, Abandoned lands, home gardens
6.	Road accessibility	B71 - Carolina -Nortonbrige- Wanaraja road B149 - Hatton-Maskeliya-Dalhouse 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: Residential Non-Residential	(i)(a) 0.55 ha home gardens (b) 7.14 ha Tea lands (a) 2 (AP1-AP2), 1(AP3-AP4), 2(AP5-AP6), 1(AP8-AP9), 3AP19-Gantry)But need ground confirmation.
8.	220 kV/132 kV transmission line crossing	
9.	33 kV/11 kV line crossings	AP2-Gantry
10.	Road crossing	B71 road three times crossing (AP1-AP2), (AP3-AP4), B149(AP19-Maskeliya gantry)
11.	National Highway/Major road Crossing	No major road (A grade) crossing
12.	Telephone line crossing	Unable to guess using maps
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- (a) Trees to be felled (b) Trees to be lopped	
15.	No. of private trees (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	(2) 70 trees
16.	Length of line in (a)marshy area (b) water bodies	(a) None (b) 0.02 km
17.	Length of line in tea land area	4.76 km
18.	Length of line in home garden area	0.37 km
19.	Length of line in (a)un-cultivated area (b) forest / scrub land	(c) 3.9 km (d) 0.1 km
20.	Highest altitude en-route the line	4346 ft near Maskeliya Gantry
21.	Nearest distance from coast/port and airports	74 km to the coast 72 km to Rathmalana Air port

Sr. No	Description	Option 1
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious ~~or~~ ~~Archaeological~~ sites	
24.	Name of villages involved/Name of Province	Midford, Donnybrook, Glengarift, Dandukelegala, Osberon , Clarvarson, Castelreagh, Dunkelo, Blair athol, Kuda Maskeliya Central province
25	Land to be permanently acquired: Area (in ha)Cost.	

Table 4.12: Summary of the description for Kegalle (Molagoda) GS to Gevilitpitiya Gantry 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	11 km (13.3 km according to google earth)
2.	Canal / River crossings	None
3.	(i) Forest/ scrublands Area (ha)	(iii)
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Available information not enough to fill the blank
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 39, Terminal towers- 02 Suspension Towers 8 0.198 ha (55 x 36 / 10000)
5.	Land Strata	Paddy fields, Rubber plantations, Coconut plantations scrublands, Abandoned lands & Agricultural lands
6.	Road accessibility	Ambululugla Road, Kandewatta Road Hettimulla-Divala-Ussapitiya Road Arawapola-Sudugala Road, Colombo-Kandy Highway
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: Residential Non-Residential	 (i)a)6.58 km home gardens 8.27 km paddy fields 1.21 km Tea & Coconut plantations (ii)3.19 km Rubber plantations 1(AP0-AP1), 4(AP1-AP2), 2 (AP2-AP3), 1(AP4-AP5), 1(AP19-AP20), 1(AP20-AP21), 1(AP22-AP23), 3(AP23-24), 1(AP25-26), a(AP29-AP30), 1(AP40-Gevelipitiya gantry)
8.	220 kV/132 kV transmission line crossing	Unable to get information from map
9.	33 kV/11 kV line crossings	Unable to get information from map
10.	Road crossing	Road 1 (AP8-AP9), Road 2 (AP12-AP13), Ambululugla Road (AP15-AP16), Road 3 (APa6-AP17), Kandewatta Road (AP20-AP21), Road 4 (AP22-AP23), Hettimulla-Divala-Ussapitiya Road (AP22-AP23), twice crossing (AP23-AP24), Arawapola-Sudugala Road (AP29-AP30), Road 5 (AP38-AP39)
11.	National Highway/Major road Crossing	Colombo-Kandy Highway A01 (AP1-AP2)
12.	Telephone line crossing	Unable to get information from map
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	
14.	No. of Forest Trees :- (a) Trees to be felled (b) Trees to be lopped	
15.	No. of private trees (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	(1) 17Jak trees, 5 Del trees, 32 Coconut trees, 5 Mango trees (2)675 trees
16.	Length of line in (a) marshy area (b) water bodies	(a) (b) none
17.	Length of line in paddy /agricultural area	7.25 km
18.	Length of line in home garden area	4.97 km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(a)0.19 km (b)

Sr. No	Description	Option 1
20.	Highest altitude en-route the line	1415 ft
21.	Nearest distance from coast/port and airports	60 km to the coast 56 km to Katunayake Air port
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious ~~or Archaeological~~ sites	Unable to get information from map
24.	Name of villages involved/ Name of Province	Galpola, Wekaladeniya, Attanagoda, Panagamuwa, Polwatta, Uduwawala, Pattagama, Wewala, Lambutuwa, Bulugammana, Gewilipitiya Kegalle District, Sabaragamuwa province
25	Land to be permanently acquired: Area (in ha) Cost.	None

Table 4.13 Summary of the description for Mahiyangana GS to Bibila Gantry 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	30 km
2.	Canal / River crossings	Canal (T17-T18), Tanks cross (T1-T2),(T11-T12)
3.	(i) Forest/ scrublands Area (ha)	(iv) Forest - 6.8 ha/ scrublands /2ry forests- 36.5 ha
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 120, Suspension Towers 23 1.7 ha
5.	Land Strata	Paddy fields, forests, scrublands, tanks, Abandoned lands & Agricultural lands
6.	Road accessibility	Kandy- Padiyathalawa highway, Peradeniya-Badulla-Chenkalady highway, Bibila-Uraniya-Mahiyangana Road Kotaganwella Road, Dambarawa lake 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: Residential Non-Residential	 (i) 30.45 ha paddy land 3.25 ha in abandoned land (a) 16.11 ha home gardens
8.	220 kV/132 kV transmission line crossing	
9.	33 kV/11 kV line crossings	Yes (T27-T28), (T22-T23), (T20B-T21), (T19-T20A), (T18-TP19), (T14-T16), (Bowatta GS-T01)
10.	Road crossing	Dambarawa lake road (T1-T2), Road (T4-T5), Road (T7-T8), Road (T8-T9), Bund Road (T18-T19), 2 Roads (T21-T22), Road (T23-T24), Road (T26-T27), Road (T27-T28), Road (T42-T43), Road (T47-T48), Road (T56-T57), Road (T57-T58), Road (T59-T60)Kotaganwella Road (T69-T70), Road (T73-T74)Bibila-Uraniya-Mahiyangana Road (T84-T85), Road (T85-T86), Road (T89-T90) 2 Roads (T92-93), Road (T93-T94), Road (T99-T100), Road (T102-T103), Road (T109-T110),
11.	National Highway/Major road Crossing	Peradeniya- Badulla- Chenkalady highway (T110-T111)
12.	Telephone line crossing	

Sr. No	Description	Option 1
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- (a) Trees to be felled (b) Trees to be lopped	(a) 10
15.	No. of private trees (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	(1)a) 26 Jak trees, 3 Mango trees, 43 Coconut trees, 1 Nelli tree (2) 173 trees
16.	Length of line in (a) marshy area (b) water bodies	(a) 0.14 km (b) 0.15 km
17.	Length of line in paddy /agricultural area	20.3 km
18.	Length of line in home garden area	10.74 km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(b) 2.71 km
20.	Highest altitude en-route the line	1070 ft
21.	Nearest distance from coast/port and airports	70 km to the coast 86 km to Mattala airport
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious sites	
24.	Name of villages involved/ Name of Province	Uva province
25	Land to be permanently acquired: Area (in ha) Cost.	None

Table 4.14: Summary of the description for Monaragala GS to Wellawaya Gantry 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	34 km
2.	Canal / River crossings	
3.	(i) Forest/ scrublands Area (ha)	(v) 2ry Forests / scrublands- 9.55 ha
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 118, Suspension Towers 26
5.	Land Strata	Paddy fields, 2ry forests, scrublands, tanks, home gardens
6.	Road accessibility	Colombo-Batticaloa Highway, Silbara road, Maligawila Road, Badalkumbura-Buttala-Sellakatharagama Road and several miner roads
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building:	(i) 47.52 ha paddy land (a) 29.69 ha home gardens

Sr. No	Description	Option 1
	Residential Non-Residential	
8.	220 kV/132 kV transmission line crossing	
9.	33 kV/11 kV line crossings	
10.	Road crossing	Colombo-Batticaloa Highway T0-T1,, Silbara Road T21- T22, Maligawila Road T27-T28, Badalkumbura-Buttala-Sellakatharagama RoadT71- T72
11.	National Highway/Major road Crossing	Colombo-Batticaloa Highway T0-T1,
12.	Telephone line crossing	Yes
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	
14.	No. of Forest Trees :- (a) Trees to be felled (b) Trees to be lopped	(a) 320 Teak trees
15.	No. of private trees (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	(1)16 Jak trees, 12 Mango trees, 55 Coconut trees (2) 70 trees
16.	Length of line in (a) marshy area (b) water bodies	(b)
17.	Length of line in paddy /agricultural area	24.9 km
18.	Length of line in home garden area	8.43 km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(b) 6.21 km
20.	Highest altitude en-route the line	1300ft
21.	Nearest distance from coast/port and airports	54.96 km to the coast 48 km to Mattala Air port
22.	Nearest distance from various receptors and major installations	
23.	Distance from nearest religious ~~or Archaeological~~ sites	
24.	Name of villages involved/ Name of Province	Uva province
25	Land to be permanently acquired: Area (in ha) Cost.	

Table 2.15: Summary of the description for Elpitiya to Mattaka 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	11 km
2.	Canal / River crossings	None,
3.	(i) Forest/ scrublands Area (ha)	(vi) None
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Not applicable

Sr. No	Description	Option 1
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 29 , Suspension Towers- 15 0.19 ha for angle towers (8x8m), 0.05 ha for suspension towers (6x6 m)
5.	Land Strata	Paddy fields, Home gardens,
6.	Road accessibility	Ananda Vidyala Mawatha (B14) - (AP-1- AP2) Elpitiya –Pitagala road (B14) -(AP4-AP15) Galkadulla road - (AP16,AP17,AP18) Withanachchigoda road (AP19) Waduwatta road (AP20), Rassanwila Road (AP21) Pitigala-Mapalagama road (AP27) Ankutuwela Road (AP22-AP25) Apa Mawatha (AP26)
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: Residential Non-Residential	 (i)11.4 ha paddy fields (a) 3.54 ha home gardens
8.	220 kV/132 kV transmission line crossing	No
9.	33 kV/11 kV line crossings	33 kV line cross between (AP18-AP19)
10.	Road crossing	Awittawa- Elpitiya road (B114) - (AP2-AP3), Elpitiya-Pitigala road (B14) (AP4-AP5), (AP11-AP12), (AP14-AP15) Galkadulla road (AP15-AP16), (AP17-AP18) Porawagama Road (AP18-19) Waduwatta Road (AP19-AP20) Rassanwila Road (AP20-21) Ankutuwela road (AP22-AP23), (AP24-AP25)
11.	National Highway/Major road Crossing	No
12.	Telephone line crossing	TP line crossing at (AP11-AP12), (AP14-AP15)
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- (a) Trees to be felled (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 (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	**(1)** 2 Mango trees, 10 Jack trees,1 Mangose tree,12 Rambutan trees, 2 Del trees 46 Coconut trees **(2)** 53
16.	Length of line in (a) marshy area (b) water bodies	 No
17.	Length of line in paddy /agricultural area	7.61 km
18.	Length of line in home garden area	2.36 km
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(e) none (f) none
20.	Highest altitude en-route the line	55 m near AP 16
21.	Nearest distance from coast/port and airports	14.64 km to the coast 34.26 km to Katunayake Air port
22.	Nearest distance from various receptors and major installations	See Table

Sr. No	Description	Option 1
23.	Distance from nearest religious ~~or~~ ~~Archaeological~~ sites	
24.	Name of villages involved/ Name of Province	Ampitiya watta, Bogoda, Katandola, Thalgaspe, Gurugodalla, Pothuwilahena, Amugoda, galkadolla, Amaragoda, Keralawatta, Rassanwila, Mattakbebila, Mattaka Southern Province
25	Land to be permanently acquired: Area (in ha) Cost.	

Table 4.16: Summary of the description for Morawaka to Warukandeniya 33 kV tower line

Sr. No	Description	Option 1
1.	Length of line	18 km
2.	Canal / River crossings	None,
3.	(i) Forest/ scrublands Area (ha)	(vii) None
	(ii) Wildlife Sanctuary/National Park (in ha)	(ii) None
	(iii) Distance from nearest Wildlife sanctuary/ National Park /Forests reserves	Not applicable
4.	Development of Tower sites Number of towers Land to be acquired for tower bases	Angle Towers- 35 , Suspension Towers- 36 0.22 ha for angle towers (8x8m), 0.13 ha for suspension towers (6x6 m)
5.	Land Strata	Paddy fields, Home gardens, Tea plantations
6.	Road accessibility	Morawaka- Neluwa road (B363) - (AP0- AP2-AP3-AP4-AP5-AP8-AP9-AP10-AP11) Thalapekubura road (AP7-) Dangala-Delwala road - (AP13-AP14-AP15), Dellawa road (AP20-AP21-AP22-AP25-AP33)
7.	Private land (in ha.) (i) Agriculture:- a) Irrigated Home garden b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: Residential Non-Residential	 (i)15.435 ha paddy fields (a) 10.425 ha home gardens
8.	220 kV/132 kV transmission line crossing	132 kv line cross between (AP0-AP01),
9.	33 kV/11 kV line crossings	Two 33 kv lines cross between (AP0-AP01) One 33kV line cross between (AP5-AP6), (AP8-AP9), (AP10-AP11), (AP11-AP12), (AP15-AP16), (AP25-AP26),
10.	Road crossing	Morawaka- Neluwa road (B363) - (AP5-AP6),(AP8-AP9), (AP10-AP11), (AP11-AP12) Thalapekubura Road (AP6-AP7) Dangala-Dellawa Road (AP15-AP16)
11.	National Highway/Major road Crossing	No
12.	Telephone line crossing	TP line crossing at (AP5-AP6)
13.	Length of line passing in the t forest area/coastal area/national park/sanctuary	None
14.	No. of Forest Trees :- (a) Trees to be felled (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) (1) Fruit Trees: (a) Trees to be felled (b) Trees to be lopped (2) Non-Fruit Trees: (a) Trees to be felled (b) Trees to be lopped	(1) 3 Mango trees,10 Jack trees,3 Mango trees, 1 Del tree, 1 Rambutan tree, 35 Coconut trees (2) 56 trees
16.	Length of line in (a) marshy area (b) water bodies	 None
17.	Length of line in paddy /agricultural area	10.29 km
18.	Length of line in home garden area	6.95 km

Sr. No	Description	Option 1
19.	Length of line in (a) un-cultivated area (b) forest / scrub land	(g) none (h) none
20.	Highest altitude en-route the line	250 meters near AP 14
21.	Nearest distance from coast/port and airports	33.43 km to the coast 82.93 km to Mattala Air port
22.	Nearest distance from various receptors and major installations	See Table
23.	Distance from nearest religious ~~or Archaeological~~ sites	0.075m to Sri Gunananda Viharaya (AP 24 – AP25)
24.	Name of villages involved/ Name of Province	Kalugalyaya, Kodikaragama, Jambugashena, Alapaladeniya, Eadandukitha, Dangala, DElgahaela, Kadihingala, Moragahahena, Pannimulla, Hakpitiya Southern Province
25	Land to be permanently acquired: Area (in ha) Cost.	

Annex 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 Contraction facilities should be placed at least 500 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 10 m	CEB	Detailed design
Location of towers and 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 -	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. Careful site selection to avoid existing settlements	Site location away from water bodies, line alignment selection (distance to dwelling, water and/or agricultural land)	Consultation with local authorities and land owners, CEA water quality standards	CEB	Part of detailed project sighting and survey and design
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.	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 Sri Lankan procedures	Public complaints	Rates stipulated in the Resettlement plan/ Frame work for the project	CEB	Prior to construction phase
Encroachment	Loss of agricultural	Use existing tower footings/towers wherever	Tower location and line	Agrarian	CEB	Part of detailed

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
into farmland	productivity	possible Avoid sighting new towers on farmland wherever Farmers compensated for any permanent loss of productive land trees that need to be trimmed or removed along RoW.	alignment selection Design of Implementation of Crop and tree compensation (based on affected area) Statutory approvals for tree trimming /removal	Service Act. Consultation with local authorities and design engineers		alignment survey and design
Interference with drainage patterns/Irrigation channels	Temporary flooding hazards/loss of agricultural production	Appropriate sighting of towers to avoid channel interference	Site location and line alignment selection	Irrigation Act 1933. Consultation with local authorities and design engineers	CEB	Detailed alignment survey and design
Integrate adaptation measures	Excessive line sag	CEB uses only the standard conductor types used internationally due to their proven cost performance. The new power line ratings will be defined to ensure their design temperatures are not violated even under adverse ambient conditions such as high ambient temperature and low wind speeds. As far as the power lines are operated below their design temperatures, the consequential sag will be acceptable.		Tender document to mention detailed specifications	CEB/ Contractor	Detailed design
	Maintenance of adequate ground clearance for power lines	Transmission line ground clearance guidelines of CEB comply with international standards and there are no records of violation of these minimum clearances during construction or operation. By adhering to CEB's existing ground clearance guidelines, sufficient ground clearances will be maintained by the new power lines.		CEB guidelines on construction of transmission lines	CEB/ Contractor	Detailed design
	Shutdown mechanism for wind turbines in cases of cyclones and/or	The wind turbines installed in the hybrid power systems will have failsafe mechanical apparatus capable of yawing the wind turbines out of wind			CEB/ Contractor	Shutdown mechanism for wind turbines in cases of

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
	strong wind surges	beyond cut off wind speed of 25 m/s.				cyclones and/or strong wind surges
	Lightning protection mechanism for substations and transmission lines to avoid any injury to nearby households / communities	The transmission line designs typically used by the CEB contain protective earth shields above the phase conductors to avoid direct lightning strikes on to the phase conductors. These earth shields will be earthed at each tower avoiding propagation of the surge. Similarly, all gantries and grid substations will be equipped with a strong earth mesh to meet the touch and step voltage criterion maintained by the CEB. These measures will provide adequate protection to consumers and nearby communities against lightning surges attracted to the power lines and substations.				
	Mechanism to protect and stabilize systems/turbines from salination due to sea level rise and tsunamis (though rare but should be anticipated) and earthquakes	The locations of the hybrid power systems have been carefully selected such that the solar and wind turbines as well as the power houses can be installed well above sea level (more than 5m above maximum sea level). The environmental consultations done on the sites confirmed that the 2004 Tsunami did not rise to the elevations identified for the hybrid power systems. No earthquakes have been recorded in Sri Lanka.				
Explosions/Fire	Hazards to life	Design of substations to include modern fire control systems/firewalls. Provision of fire fighting 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						

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
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 other commercial and public activities / Public complaints	Technical specification	CEB/ PRDA / NWSDB/SLT	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 Repair /reinstate damaged bunds etc after construction completed Compensation for temporary loss in agricultural production	Land area of agriculture loss Usage of existing utilities Status of facilities (earthwork in m^3) Implementation of Crop compensation (amount paid, dates, etc.)	Agrarian Service Act. Regular monitoring compliance with regulations	CEB, Contractor through contract provisions	Throughout the construction period
Temporary outage of the electricity	Loss of power supply to the local community when tower lines crossing the new 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 emissions, [dB(a)])	Daytime construction only	CEB, Contractor through contract provisions	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
	Nuisance to elephants if the line route construction crosses elephant path	Complete restriction of construction work for two months before and after the known period of migration by the elephants	Timing of Construction	No construction for two months	CEB, Contractor	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 emissions, [dB(a)])	Daytime construction only	CEB, Contractor through contract provisions	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, gantry 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 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	Habitat loss	Fauna and flora protection Act.	CEB/ DWC/ DoF	Construction period
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	Soil erosion	Visual inspection (Turbidity and sedimentation)	CEB, Contractor through contract provisions	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		acceleration and construction work should be carefully designed to minimise obstruction or destruction to natural drainage				
Mechanised construction	Noise, vibration and operator safety, efficient operation Noise, vibration, equipment wear and tear	Construction equipment to be well maintained. Proper maintenance and turning off equipment not in use.	Construction equipment - estimated noise emissions and operating schedules	Technical specifications, safety regulations, Noise control regulations in 1994	CEB, Contractor through contract provisions	Construction period
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	Nuisance to the general public	Transport loading and unloading of construction materials should not 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 to grow up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations. 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.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres) Disposal of cleared vegetation as approved by the statutory authorities	Felling of trees (Amendment Act. No 01, of 2000 and act of felling of trees control) Presence of target species in RoW following vegetation clearance.	CEB, Contractor through contract provisions	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
			(area cleared in m^2)			
Waste Management System: Disposal of old transmission lines, used solar cell, batteries and turbines		The disposal of all waste obsolete items is governed under the national requirements listed under the - National Environmental (Protection and Quality) Regulations, No. 1 of 2008.Part I Issue of Environmental Protection License for Emission or Disposal of Waste.	Contract clauses	Environmental Protection Licence	CEB (Contractor through contract provisions)	Construction period
Disposal sites for waste materials/ spoils		Disposal sites are also mandated of how to dispose of waste from construction as per local municipal laws (not reproduced here). Sri Lanka being an island nation, this is dealt as per national norm.	Contract clauses	Environmental Protection Licence	CEB (Contractor through contract provisions)	Construction period
Labour camps		No permanent labor camps are required as most of the sites are near populated areas. Construction sites which is existing in some cases has temporary facilities such as water, toilets etc				
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)	Health and safety regulations	CEB (Contractor through contract provisions)	Construction period
Nuisance to nearby properties	Losses to neighbouring land uses/ values	Contract clauses specifying careful construction practices. Use existing access ways as much as possible. Productive land will be reinstated following completion of construction Compensation will be paid for loss of	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 after completion of	CEB (Contractor through contract provisions)	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		production, if any.		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 Tower line	Exposure to electromagnetic interference	Tower 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 100% 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
Periodic Repair and maintenance		The periodic repair and maintenance is usually part of O&M contracts given separately or done departmentally after the period of installation, guarantee period of two years (or CEB may be asking for more). The preventive maintenance schedules of the diesel generators, wind turbines, solar PV and batteries recommended by the equipment suppliers will be adhered to by the CEB. For MV and LV networks, CEB has ongoing maintenance and repair programs, which the new project elements will be added on to.	Proper maintenance of equipment	Periodic maintenance	CEB/ Contractor	Throughout the operation

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Occupational health and safety		Provisions for first aid and medical kits and ambulances are usually made EPC contractor through contract provisions.				

Annex 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)	SO_2, NO_2, CO, PM10, TSPM	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	A single time	NAAQS of Sri Lanka	Per sample LKR 9,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/ CEB/CEA
	B. Construction Stage	SO_2, NO_2, CO, PM10, TSPM	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	Two times	NAAQS of Sri Lanka	Per sample LKR 9,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/ CEB/CEA
	C. Operation Stage	SO_2, NO_2, CO, PM10, TSPM	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	A single time	NAAQS of Sri Lanka	Per sample LKR 9,000	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA
2. Water Quality	A. Pre-construction stage (The project after assign to contractor)	EC, TSS, DO, BOD, P^H Oil and grease, E	Nearest wells (2 wells) around gantry, waterbodies, lagoons (more than one sample)	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, E	Nearest wells (2 wells) around gantry, waterbodies, lagoons (more than one sample)	1 time/ 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, E	Nearest wells (2 wells) around gantry, waterbodies, lagoons (more than one sample)	1 time/ 3 months	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 gantry, near major building (more than one sample)	A single time	National Environmental (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/ CEB/CEA
	B. Construction Stage	Noise level (dB level)	Inside and outside (0.5 km) of the	2 times year	National Environmen	Per sample	Contractor by engaging approved monitoring	Contractor/ CEB/CEA

Environmental component	Project stage	Parameters to be monitored	Location	Frequency	Standards	Rate (LKR)	Implementation	Supervision
			proposed gantry, near major building (more than one sample)		tal (Noise Control) Regulations, NAAQS	LKR 6,500	agency(Sri Lankan Government)	
	C. Operation Stage	Noise level (dB level)	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	3 times year	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, Sulphate (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	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/ CEB/CEA
	B. Construction Stage	P^H, Sulphate (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, Sulphate (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

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
DO- Dissolved Oxygen
TSS- Total Suspended Solis
BOD- Biological Oxygen Demand
NAAQS- National Air Quality Standards
CEA- Central Environmental Authority
NWQS- National Water Quality Standards
CEB- Ceylon Electricity Board
ORP- Oxidation Reduction Potential

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).

Annex 7: Granting of Necessary Way leaves 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.

Annex 8: Environment Monitoring Report

Illustrative Contents of Environment Monitoring Report

A8.0 Table Details of work award

Locations	Sub-projects components (Package No.)	Starting date of Implementation	Projected months of completion	Schedule date of completion (Extended date of completion)	Physical progress (%) as on -----

A8.1 Table: Details of On-going works

Locations	Sub-projects Components (Package No.)	Listing of works under the package	What type of works continued at present	Expected changes from approved scope	Fulfilment of objectives- Type of remedial measures needed	Key assumptions and risks that affect attainment of the objectives

A8.2 Table: Progress of Environmental Management Plan

SNo.	Environmental components related to project activities	Compliance		Explanation (in case of done or not done justification necessary)
PRECONSTRUCTION STAGE				
		YES	**NO**	
1	Site preparation work completed by PIU including necessary clearance.			
CONSTRUCTION STAGE				
2	PCBs not used in transformers or other project facilities or equipment Processes, equipment and systems not to use chlorofluorocarbons (CFCs), including halogen Use of PCBs and			AIR, CUTTING FILLING, LANDFILL WASTE WATER TREATMENT

SNo.	Environmental components related to project activities	Compliance		Explanation (in case of done or not done justification necessary)
	CFCs in the existing systems should be phased out and to be disposed of in a manner consistent with the requirements of the government.			
3	Careful site selection to avoid existing settlements.			
4	Involuntary resettlement or land acquisition.			
5	Avoid encroachment into precious ecological areas by careful siting and alignment selection.			
6	Avoid encroachment into forestland.			
7	Avoid encroachment into farmland.			
8	Better design to ensure noise will not be a nuisance.			
9	Appropriate placement of equipment to avoid drainage/channel interference.			
10	Equipment specification with respect to potential pollutants.			
11	Construction technique and machinery selection to minimize noise disturbance.			
12	Construction activities to be scheduled to avoid disturbance to farming activity.			
13	Construction equipment to be well maintained and turn of the plant not in use to avoid noise, vibration and operator safety.			
14	Existing roads and tracks used for construction and maintenance access to the line.			
15	Marking of vegetation to be removed prior to site clearance and strict control on clearance activities to ensure minimal clearances.			
16	For power evacuation line, trees allowed growing up to a height within the ROW by maintaining adequate clearance between the top of tree and the regulator as per the regulations. Trees that can survive pruning should be pruned instead of clearing.			
17	Construction workers prohibited from harvesting wood in the project area.			
18	Dispose scrap materials such as batteries, transformers, conductors, capacitors etc. in environmentally sound manner.			
19	Tree clearances/cutting as per forest/tree cutting act clearance.			
20	Excavated earth to be stored and reused for back filling.			
21	Fuels and other hazardous materials to be stored above high flood level.			
22	Noisy construction activities shall be carried out during day time.			
23	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.			
24	Existing irrigation facilities are to be maintained. Use existing access roads for transportation of materials Protect/preserve top soil and reinstate after construction is completed Repair/reinstate damaged bunds etc. after construction.			
25	Take measures to prevent erosion and /or silt			

SNo.	Environmental components related to project activities	Compliance		Explanation (in case of done or not done justification necessary)
	run off. Limit site clearing to work area Regeneration of vegetation to stabilize work areas on completion. Avoidance of excavation in wet season. Water courses protected from siltation through use of bunds and sedimentation ponds.			
26	Careful construction practices to avoid loss to neighboring properties. Productive land to be reinstated after construction Compensation for loss of production.			
27	Existing borrow sites will be used to source aggregates therefore no need to develop new sources for aggregates.			
28	Ensure health and safety of workers.			
29	Training to the EA environmental monitoring personnel.			
30	Effective environmental monitoring system using checklist.			
31	Hiring of Environment and Social Consultant (s) by EA for implementation and monitoring of EMP.			