

# Addendum to Initial Environmental Examination

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Project Number: 51308-001  
February 2022

## India: Chennai - Kanyakumari Industrial Corridor: Power Sector Investment Project

Prepared by Tamil Nadu Transmission Company (TANTRANSCO), Government of Tamil Nadu (Department of Energy) for the Asian Development Bank. This is an updated addendum to the Initial Environmental Examination originally posted in July 2019 available on <https://www.adb.org/projects/documents/ind-51308-001-iee-0>.

## CURRENCY EQUIVALENTS

(as of 13 October 2021)

Currency unit = Indian rupee/s (₹)

₹1.00 = \$.0.013

\$1.00 = ₹75.49

## ABBREVIATIONS

ADB	- Asian Development Bank
ACSR	- aluminium-conductor steel reinforced
AMSL	- above mean sea level
CEA	- Central Electricity Authority
CPCB	- Central Pollution Control Board, Government of India
DPR	- detailed project report
EIA	- environmental impact assessment
EMoP	- environmental monitoring plan
EMP	- environmental management plan
EHV	- extra high voltage
EPC	- engineering, procurement, and construction
GCC	- General Construction Circle of TANTRANSCO
GHG	- greenhouse gas
GoTN	- Government of Tamil Nadu
GRM	- grievance redress mechanism
CKIC	- Chennai-Kanyakumari Industrial Corridor
TNPCB	- Tamil Nadu State Pollution Control Board
TANTRANSCO	- Tamil Nadu Power Transmission Corporation Limited
TNEB	- Tamil Nadu Electricity Board
IEE	- initial environmental examination
IFC	- International Finance Corporation
LILO	- line-in-line-out
MFF	- multi-tranche financing facility
MOEFCC	- Ministry of Environment, Forests and Climate Change, Government of India
PGCIL	- Power Grid Corporation of India Limited
RoW	- right of way

## WEIGHTS AND MEASURES

ha	- hectare (10,000 m <sup>2</sup> )
km	- kilometer (1,000 m)
kV	- kilovolt (1,000 volts)
kW	- kilowatt (1,000 watts)
kWh	- kilowatt-hour
MVA	- megavolt-ampere
MW	- megawatt

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## I. INTRODUCTION

### A. Introduction and Background of the Project

1. This addendum is prepared for the Initial Environmental Examination (IEE) report, dated July 2019 of the Chennai-Kanyakumari Industrial Corridor (CKIC) - Power Sector Investment Project being funded under an Asian Development Bank (ADB) loan for the CKIC Power Sector Investment Project approved by ADB in November 2019. The project includes the following outputs:

- (i) **Output 1: Transmission link from southern CKIC to load centres in northern CKIC.** This will establish a 765 kilovolts (kV) substation in Virudhunagar and 765 kV power transmission link between the power generation hub in Madurai–Thoothukudi area (in the southern part of the CKIC) and load centres in the northern parts of the CKIC.
- (ii) **Output 2: Pooling substation established in Thoothukudi district.** This will establish a 400 kV pooling substation and associated transmission lines to receive electricity generated from power plants in the Thoothukudi district.
- (iii) **Output 3: Financial and Institutional Capacity of Tamil Nadu Transmission Corporation Limited (TANTRANSCO) improved.** This will be delivered through an attached technical assistance grant.

2. For effective implementation of the project, it has been split into seven packages as illustrated in **Table 1**. Package 1 includes a substation and transmission lines, package 2 deals with the construction of a substation, and rest of the packages (3, 4, 5, 6, and 7) deal with the construction of transmission lines.

**Table 1: Packages and Award of Contracts**

<b>Name of Package</b>	<b>Description</b>	<b>Name of Contractor</b>
Package 1 (T-2096)	Ottapidaram 400 kV Substation and 400 kV Transmission Lines associated with Ottapidaram Substation: i. 400 kV D/C from Kamuthi to Ottapidaram ii. 400 kV D/C from Udangudi to Ottapidaram	Larsen & Toubro Ltd.
Package 2 (T-2086)	Virudhunagar 765/400 kV Air Insulated Substation	Megha Engineering & Infrastructures Ltd.
Package 3 (T-19)	400 kV Transmission Lines associated with Virudhunagar Substation	Megha Engineering & Infrastructures Ltd.
Package 4 (T-20)	765 kV Transmission Lines Package 1 associated with Virudhunagar Substation	Kalpataru Power Transmission Ltd.
Package 5 (T-21)	765 kV Transmission Lines Package 2 associated with Virudhunagar Substation	KEC International Ltd.
Package 6 (T-22)	765 kV Transmission Lines Package 3 associated with Virudhunagar Substation	Transrail Lighting Ltd.
Package 7 (T-28)	230 and 110 kV Transmission Lines associated with Ottapidaram Substation	Transglobal Power Ltd

Source: Tamil Nadu Power Transmission Corporation Limited (TANTRANSCO)

3. The substation components do not have any changes in the proposed interventions. However, transmission line components are undergoing some changes. Major alignment change

is witnessed in the packages 3 and 5. Therefore this addendum to the IEE report has been prepared to fulfil ADB's requirements for any change in project interventions (including transmission alignments) as specified in the Loan Agreement (conditions for award of contracts [Commencements of Works]).

## **B. Extent of the Addendum**

4. This addendum covers the major and minor changes in the transmission alignments. The key changes to the initial proposal (as per the detailed project report [DPR] and the IEE, July 2019) are as follows:

- **Package 1 (Ottapidaram 400kV Substation and 400 kV Transmission Lines associated with Ottapidaram Substation):** There is no change in the initial proposal for the construction of the substation at Ottapidaram. However, for the transmission lines, due to the minor deviations, the length has been slightly altered for the Ottapidaram to Udangudi section and for the Ottapidaram to Kamuthi section.
- **Package 2 (Virudhunagar 765/400 kV Air Insulated Substation):** There is no change to the initial proposal for construction of the substation at Virudhunagar.
- **Package 3 (400 kV Transmission Lines associated with Virudhunagar Substation):** There is a major change in the transmission line alignment due to further techno-economic analysis but no increase in the overall length of transmission line.
- **Package 4 (765 kV Transmission Lines Package 1 associated with Virudhunagar Substation):** There are some minor changes to the initial proposal with respect to the tower locations, the length has been slightly altered.
- **Package 5 (765 kV Transmission Lines Package 2 associated with Virudhunagar Substation):** There is a major change in the transmission line alignment to avoid the forest land acquisition and forest clearance, the transmission line is longer.
- **Package 6 (765 kV Transmission Lines Package 3 associated with Virudhunagar Substation):** There are minor changes to the initial proposal in the location for some of the towers with the length of the transmission line slightly altered.
- **Package 7 (230 and 110 kV Transmission Lines associated with Ottapidaram Substation):** There are minor changes to the initial proposal in the location for some of the towers with the length of the transmission lines slightly altered.

## **C. Outline of the Addendum**

5. This addendum has been prepared to present the key issues associated with the proposed changes in the transmission alignments and includes sections on:

**Chapter-1: Introduction:** Presents the background, extent of the addendum, and structure of the report.

**Chapter-2: Proposed Changes in the Transmission Line Alignments:** Gives details of the proposed changes in the transmission line alignments and justification.

**Chapter-3: Environmental Quality of the Project Area:** Discusses the key environmental features including the quality of the ambient air, noise, water, and soil in the project area.

**Chapter-4: Anticipated Environmental Impacts and Mitigation:** This chapter details out environmental impacts, avoidance, mitigation, and enhancement measures due to changes in the transmission line alignments.

**Chapter-5: Environmental Management and Enhancement:** Suggests key environmental impacts and mitigation measures including updated Environmental, Health and Safety (EHS) measures, and compensatory plantation for the proposed changes in the transmission alignments.

**Chapter-6: Public and Stakeholder Consultations:** Gives details of the consultations undertaken as part of changes in transmission line alignments.

**Chapter-7: Conclusions and Recommendations:** Covers key findings and recommendations.

## II. PROPOSED CHANGES IN THE TRANSMISSION LINE ALIGNMENTS

### A. Justification for Proposed Changes

6. Initial transmission line alignments were studied by the Institute for Remote Sensing (IRS), Anna University, Chennai, based on which the DPR and other project documents including the IEE, July 2019 were prepared. At the time of project implementation, the initial project designs have been reviewed and undergone changes based on the site conditions. For the seven packages assigned, there has been no change in the design of the substations in packages 1 (Ottapidaram) and 2 (Virudhunagar) and hence the prepared EMP still holds well. However, for the transmission lines packages, the location for some of the towers are being changed by the contractors due to the administrative and social issue e.g., presence of forest areas, surface water bodies, and settlements. Packages 3 and 5 are proposed for major change in the transmission line alignments, hence, there is a need for the preparation of the addendum to the disclosed IEE report. The reasons for changing the angle point locations and number of angle points were reviewed by TANTRANSCO and verified with the contractors before being approved. Further details of the alternatives assessment undertaken as well as tower coordinates are included in the Resettlement Plan, August 2021.

### B. Revised Transmission Line Alignments

7. As indicated in Chapter 1 (section B), transmission line packages are undergoing changes as per the site conditions. Table 2 illustrates the initial interventions and the proposed (revised) interventions.

**Table 2: Details of the Revised Transmission Line Alignments**

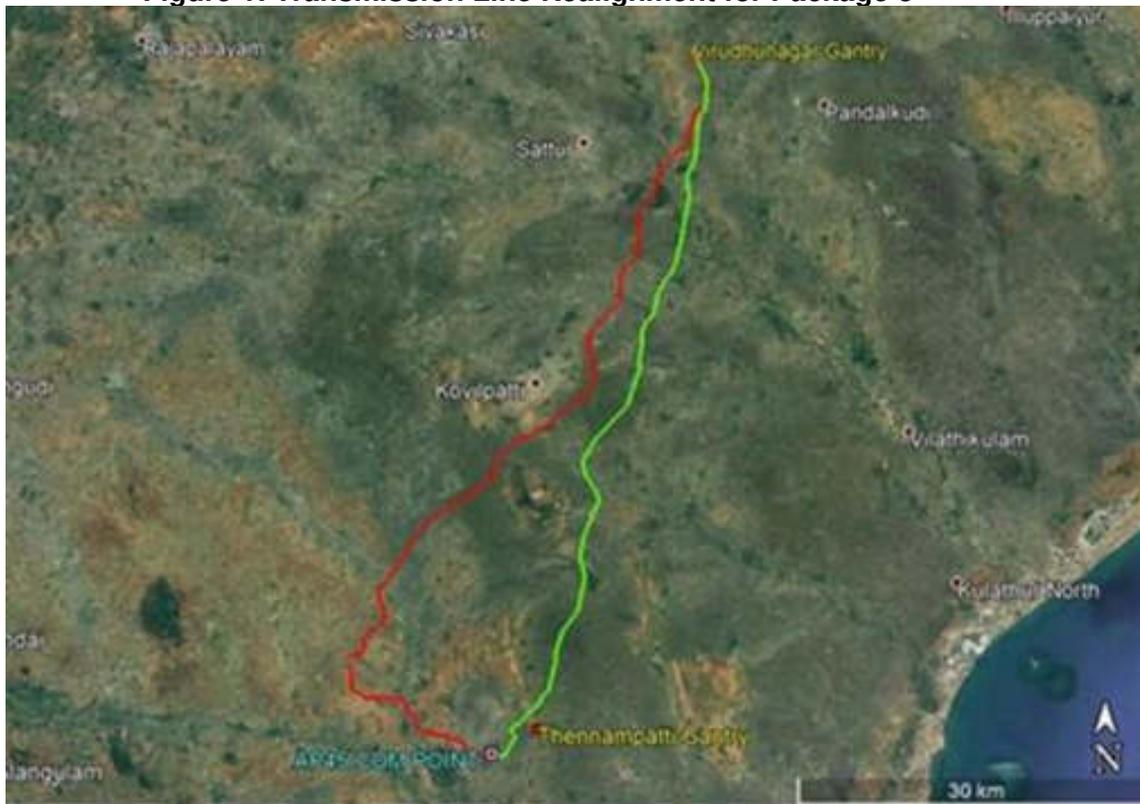
Name of Package	Proposed Changes	Remarks
Package 1 (T-2096)	Minor changes in the location for some of the towers due to administrative and social issue	Due to the changes, there is a slight increase in length and the number of Angle Points (AP) for Ottapidaram to Kamuthi transmission line (71.6km, 48 AP) and an increased number of AP (67.9 km, 81 AP) for Ottapidaram to Udangudi transmission line.
Package 2 (T-2086)	None	Construction shall be initiated without any revision.
Package 3 (T-19)	Major realignment in the transmission line (refer to <b>Figure 1</b> ) as follows: Length: 70.2 km Angle Points: 73 Reserve Forest: Nil Railway Crossing: 1 National Highways/ Road crossing: 2 River crossing: 2 (Vaippur River and Uppar River)	Initially the transmission line was proposed to terminate at Kayathar Substation (SS) from Virudhunagar SS (72 km) but, due to techno-economic reasons, Tamil Nadu Power Transmission Corporation Limited (TANTRANSCO) has proposed to terminate the transmission line at a common point of AP 45 of the existing 400 kV transmission line from Kayathar SS to Thennampatti SS. The length is shorter, and number of AP is reduced from 105 to 73.

Name of Package	Proposed Changes	Remarks
Package 4 (T-20)	Minor changes in the location for some of the towers due to administrative and social issue	Transmission line traverses through stretch of the Uttappanayakkanur Reserve Forest area for which obtaining forest clearance is mandatory. Total length of the 765 kV transmission line under packages 4-6 has increased to 252.57 km with an increased number of AP (319) with 86.9 km under Reach 1 section
Package 5 (T-21)	Major realignment in the transmission line (Refer to <b>Figure 2</b> ) as follows: Length: 94.544 km Angle Points: 120 Reserve Forest: Nil Railway Crossing: 3 National Highways/ Road crossing: 3 River crossing: 1 (Kodavanar River)	Based on the alternate design, the impact has been reduced by (i) avoiding the reserve forest, and (ii) impacts on the settlement. Total length of the 765 kV transmission line under packages 4-6 has increased to 252.57 km with an increased number of AP (319) with 94.544 km under Reach 2 section
Package 6 (T-22)	Minor changes in the location for some of the towers due to administrative and social issue	Due to the administrative and social issue, some of the tower locations are shifted – total length of the 765 kV transmission line under packages 4-6 has increased to 252.57 km with an increased number of AP (319) with 71.4 km under Reach 3 section
Package 7 (T-28)	Minor changes in the location for some of the towers due to administrative and social issue	Due to the administrative and social issue, some of the tower locations are shifted. Length of the transmission lines and AP has altered. Line A – 10.88 km, 29 AP Line B – 6.23 km, 19 AP Line C – 8.95 km, 26 AP Line D – 34.41 km, 66 AP Line E – 3.31 km, 13 AP

Source: Contractors appointed by TANTRANSCO

Note: the initial number of AP under Package 3 was incorrectly reported as 27 instead of 105 AP in the IEE, July 2019  
SS = Substation, TANTRANSCO = Tamil Nadu Power Transmission Corporation Limited, AP = Angle Point, kV = kilovolt

**Figure 1: Transmission Line Realignment for Package 3**



Google map showing both old alignment (in red) and the revised route (in green)  
 Source: Contractors appointed by TANTRANSCO

**Figure 2: Transmission Line Realignment for Package 5**



Google map showing both old alignment (in red) and the revised route (in green)  
 Source: Contractors appointed by TANTRANSCO

**C. Update in the Regulatory Requirements**

8. In the disclosed IEE report, July 2019 under Table 5 (Indian regulations as applicable for the project), the following acts or rules were omitted or have since been introduced. They are to be included and complied with by TANTRANSCO/contractors, as well as the latest amendments to those acts and rules already listed. Project specific statutory requirements for the contractors are given in

**Table 3.**

<b>Sl.</b>	<b>Act / Rules</b>	<b>Compliance Requirements under the Regulation</b>
1.	Solid Waste Management (SWM) Rules 2016	Activities and actions required to manage waste from its inception to its final disposal
2.	Construction and Demolition Waste Management Rules, 2016	Collection, segregation of concrete, soil, and other construction materials; storage of generated construction and demolition waste to be carried out as directed or notified by the concerned local authority in consonance with these rules
3.	Plastic Waste Management Rules, 2016	These rules apply to “every waste generator, local body, Gram Panchayat, manufacturer, Importers and producer”. Wastes to be segregated and disposed as per Solid Waste Management Rules
4.	a. Ancient Monuments Preservation Act 1904 b. Ancient Monuments and Archaeological Sites and Remains Act 1958 and its amendments c. Ancient Monuments and Archaeological Sites and Remains (Framing of Heritage Bye laws and Other Functions of Competent Authority) Rules, 2011 d. National Monument Authority Rules, 2011	Activities that may be permitted and prohibited near the ancient monuments, archaeological sites and remains
5.	Motor Vehicle Act 1988 its subsequent amendments	Empowers State Transport Authorities to enforce standards for vehicular pollution and issuance of Pollution Under Control certificates
6.	Explosives Act (and Rules) 1884 (1983) its subsequent amendments	Sets out the regulations as regards to the usage and storage of explosives
7.	Regulation of Polychlorinated Biphenyls (PCBs) Order, 2016	Provides guidance on the usage of PCBs and prohibits the usage of PCBs in any form by 31 December 2025
8.	Public Liability and Insurance Act, 1991	Act provides for protection to the public from accidents caused from hazardous materials resulting in continuous or intermittent or repeated exposure to death of, or injury to, any person or damage to any property
9.	Contract Labour (Regulation and Abolition) Act, 1970 and Rules	Deals with all hiring to be done through a licensed contractor. Planned to be replaced by The Occupational Safety, Health and Working Conditions Code, 2020 but it is yet to come

		into force through an official gazette notification
10.	Code on Wages, 2019	Code repealed and replaced Payment of Wages Act, 1936, the Minimum Wages Act, 1948, the Payment of Bonus Act, 1965, and the Equal Remuneration Act, 1976. The Code has consolidated all the provisions of the four labour laws that has been repealed regarding wage and bonus payments and makes it mandatory for payment of minimum wages and timely payment of wages for all workers in India
11.	Code on Social Security, 2020	Code repeals and consolidated the Workmen's Compensation Act, 1923, The Employees' Provident Funds and Miscellaneous Provisions Act, 1952, The Payment of Gratuity Act, 1972, The Employees' State Insurance Act, 1948 etc. Insurances to be obtained by the contractors for the project

Source: ADB TA Consultant

SWM = Solid Waste Management, PCB = Polychlorinated Biphenyls

**Table 3: Statutory Permissions/ Licenses/ No Objection Certificates to be Obtained by the Contractors**

Sl.	Licenses / Permissions	Compliance Requirements under the Regulation
1.	Building and Other Construction Workers (BOCW) Registration	Applicable, registration under the key legislation providing guidelines for onsite labour and worker management and welfare during construction.
2.	Labour License	Applicable, to any establishment in which 20 or more workmen are employed on any day of the accounting year as contract labour.
3.	Inter State Migrant Workers Registration	Applicable, where workers and labourers working at the project sites during construction are migrants from other states.
4.	Workmen Compensation Policy	Applicable, it covers the statutory liability of an employer for the death, disability, and bodily injuries of his employees caused by accidents arising out of and during their employment.
5.	Employees' Provident Fund (EPF) Registration	Applicable, as per EPF scheme rules, it is mandatory for an employee to join the EPF scheme if employee's pay is less than or equal to Rs 15,000 a month.
6.	License for Electrical Contractor	Applicable, electrical contractor license is an acceptance to work at certain level of voltage (voltages equal to or higher than 11 kV).
7.	Pollution Under Control (PUC) Certificate	Applicable, the PUC certification for vehicles indicates that a vehicle's emissions are in alignment with standard pollution norms and are not harmful to the environment.
8.	No Objection Certificate (NOC) for controlled blasting for excavation if any blasting is involved: a. Shot firer <sup>1</sup> license b. Explosive license c. Explosive transport license	Applicable, blasting license allows a person to carry out blasting operations (use up to 5 kg of explosives). User registration with the competent authority (controller of explosives) is required for blasting operations.
9.	Workmen's Compensation Insurance Policy	Applicable, provides legal liability coverage for compensation to the labourers for bodily injury or death caused due to accidents and/or occupational diseases arising out of and in the course of employment.
10.	Forest Conservation Act, 1980	Applicable, Package 4 (765 kV transmission lines Package 1 associated with Virudhunagar Substation) requires forest clearance for the transmission line which traverses through Uttappanayakkanur reserve forest area. Tree felling permissions may also be required outside of forest areas.

Source: ADB TA Consultant

BOCW = Building and Other Construction Workers, EPF = Employees' Provident Fund, PUF = Pollution Under Control, NOC = No Objection Certificate

<sup>1</sup> "Shot firer" means a competent person recognised and certified by the Controller for carrying out blasting operation using explosives in areas not coming under the Mines Act, 1952 (35 of 1952)

### III. ENVIRONMENTAL QUALITY OF THE PROJECT AREA

9. In the disclosed IEE report, July 2019, Chapter 4 (Description of Environment) was prepared using secondary information and it was suggested to conduct primary environmental monitoring before the start of the construction activities to maintain the recorded observations as a baseline for further environmental monitoring during the project construction. Accordingly, primary environmental monitoring has been conducted for all the packages and the outcome of the environmental monitoring has been discussed in the following sections. The detailed results of the analysis are given in **Appendix 1**. Similarly, an ecological assessment along the route of transmission lines was conducted to assess the flora and fauna of the project area in proximity to the towers. The flora and fauna of the project area with special reference to endemic, nationally protected, or globally critically endangered/endangered species and sites used for wildlife activities such as foraging, roosting, breeding, nesting, or as migratory paths were documented (refer to **Appendix 2**).

**A. Package 1 (Ottapidaram 400 kV Substation and 400 kV Transmission Lines associated with Ottapidram Substation)**

**1. Physical Environment**

- a. Ambient air quality.** 11 sampling locations (Ottapidaram, Vilathikulam, Iyan Sengal Padai, Kila Seithailai, Kamuthi, Parunali, Ramachandrapuram, Melathattaparai, Dalavoipuram, Meenakshipatti and Eral) have been chosen for conducting ambient air quality (AAQ) measurements. The project site is mostly rural and agriculture area. No industries are located near to the project site. It is also located away from cities with lesser traffic movement. From the monitoring outcomes, the concentration of the PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub> and NO<sub>x</sub> are well within the stipulated limits prescribed by the Central Pollution Control Board, Government of India (CPCB). Among the observed values, high concentration of the PM<sub>10</sub> is recorded at Dalavoipuram (58.4 µg/m<sup>3</sup>), followed by Melathattaparai (55.2 µg/m<sup>3</sup>). Similarly, high concentration of PM<sub>2.5</sub> is recorded at Parunali (24.7 µg/m<sup>3</sup>), followed by Eral (23.9 µg/m<sup>3</sup>). The concentrations at the other sites are within the national limits. However, in comparison with the World Health Organization (WHO) air quality guideline 2005 (in force at time of project approval) the PM<sub>10</sub> concentration recorded at all sites are slightly higher than the stipulated limits of 50 µg/m<sup>3</sup>. To ensure air quality is not made any worse the contractors need to pay attention to dust management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.
- b. Ambient noise levels.** Noise levels are monitored at the locations chosen for conducting the AAQ monitoring. The measurements were carried out at each location over 24 hours on an hourly basis for two days in a week using a digital noise level meter. From the observations it is evident that except Ottapidaram (57.2dB[A]) and Vilathikulam (56.4dB[A]), the noise levels are within the permissible national limits/WHO community noise guidelines of 55 dB(A) for other locations. For nighttime noise levels, except Dalavoipuram (42.9dB[A]), all other locations exceed the stipulated national limits/WHO community noise guidelines of 45dB(A). The noise levels recorded at night may be due to the blowing of heavy wind, where the noise level meter is so sensitive as to record any minute disturbances. To ensure noise levels are not made any worse the contractors need to pay attention to noise management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction plus operation for the SS.
- c. Groundwater quality.** Groundwater samples have been collected from 17 locations and analysed for physico-chemical parameters. From the analysis the pH was observed to be in alkaline. The dissolved oxygen concentration ranges between 4.4 and 5.9 mg/l. The absence of E. coli and total coliform confirms that the groundwater is not significantly contaminated with sewage. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that surface and groundwater quality remains in line with baseline results. During construction plus operation for the SS water quality should be monitored in line with the EMoP.

- d. **Soil Quality.** Soil samples were collected from 17 locations along the two transmission lines ([i] Kamuthi to Ottapidaram and [ii] Udangudi to Ottapidaram) and for the substation located at Ottapidaram. The collected samples were analysed for physico-chemical parameters. The key parameters include chlorides, conductivity, moisture, pH, total organic matter, total soluble sulphate, and total water-soluble solids. From the analysis the concentration of chloride was observed to be high (529 mg/kg) at Kallamozhi location in comparison with other locations. The conductivity is also observed to be high in Ottapidaram substation location, measuring 3210  $\mu\text{s/cm}$ . Alkaline soil was observed at Inyan Sangalpadi (pH 9.23), followed by Kallamozhi (pH 9). Presence of organic matter is observed to be less for all the locations. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that soil quality remains in line with baseline results. During construction plus operation for the SS soil quality should be monitored in line with the EMoP.

## 2. Biological Environment

- a. **Flora.** Based on field observations, the northern stretch from Ottapidaram to Kamuthi comprises of open vegetation and Teri vegetation. The southern stretch from Ottapidaram to Udangudi also comprises of similar vegetation pattern. Predominant land use along the transmission line is agriculture. Cultivation of paddy, banana plantation, vegetables and pulses plantation are observed at the time of survey. The shrubs and trees observed include *Prosopis juliflora*, *Cocus nucifera*, *Tamarindas indica*, *Psidium guajava*, *Morinda tinctoria* and *Moringa oleifera* were encountering most frequently. *Mangifera indica*, *Leucaena leucocephala*, *Phyllanthus emblica*, *Pithecellobium dulce*, *Ricinus communis*, *Tectona grandis* *Azadirachta indica*, *Borassus flabellifer*, *Calotropis procera*, and *Cassia auriculata* were also observed. These are all species which have low importance from a conservation point of view and the plants were common in the project area.
- b. **Fauna.** Diversity of avifauna is evident by the presence of the following species: little cormorant, purple moorhen, bronze-winged jacana, baya weaver, common myna, snake bird (tarter), Indian peafowl (Schedule I species [as per the Wildlife (Protection) Act, 1972), coot, Indian red vented bulbul, black drango, median egret, baya weaver, Indian pond-heron, black kite, Eurasian collard dove, Brahminy kite, and common babbler, etc. The animals reported were mostly nocturnal in nature.
- c. **Critical habitat triggers.** There were no CR/EN/VU or Schedule I species (as per the Wildlife [Protection] Act, 1972) except Indian peafowl recorded during ecological surveys, and no protected area/Important Bird Area (IBA) in the vicinity of the project area (within 10 km radius from the transmission line). Biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

## B. Package 2 (Virudhunagar 765/400 kV Air Insulated Substation)

### 1. Physical Environment

- a. **Ambient air quality.** TANTRANSCO has conducted environmental monitoring for ambient air quality at Virudhunagar Substation on 21 October 2020 by using Tamil Nadu Pollution Control Board (TNPCB) as a monitoring agency. From the analysis, the PM<sub>10</sub> concentration ranges between 24 to 42µg/m<sup>3</sup>, the PM<sub>2.5</sub> concentration is 8µg/m<sup>3</sup>, SO<sub>2</sub> concentration ranges between 4.1 to 5.9 µg/m<sup>3</sup> and NO<sub>x</sub> concentration ranges between 9.5 to 10.4µg/m<sup>3</sup>. It is evident that the AAQ monitoring results are below the stipulated national standards. The recorded information can be used as reference data for comparing the AAQ during the project construction. In comparison with WHO air quality guideline 2005 (in force at time of project approval), the recorded ambient quality (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub>) concentrations are well within them. Contractors need to ensure that the air quality levels stay within these limits during construction and monitor per the EMoP through construction.
- b. **Ambient noise levels.** Noise levels were monitored by TANTRANSCO using Tamil Nadu Pollution Control Board (TNPCB) as a monitoring agency. From the analysis, it is evident that the ambient noise levels are below the stipulated national standards/WHO community guidelines, ranging between 37.9 to 47.6 dB(A). The recorded information can be used as reference data for comparing the ambient noise levels during the project construction. Contractors need to ensure that the noise levels stay within these limits during construction and monitor both day and night-time noise levels as per the EMoP throughout construction, plus operation for the SS.
- c. **Groundwater quality and soil quality.** Groundwater quality and soil quality has not been conducted for this package. Hence the contractor has been instructed to conduct environmental monitoring for every quarter as per the environmental monitoring plan (EMoP) given in the contract agreement. During construction plus operation for the SS water and soil quality should be monitored in line with the EMoP.

### 2. Biological Environment

- a. **Flora.** Predominant land use pattern surrounding Package 2, Virudhunagar Substation is agriculture. Paddy, cotton, maize, groundnut, banana, drumstick, marigold, and other vegetables (including chilli, tomatoes, and spinaches) are the major cash crops that are being cultivated. Typical grasses observed in the project area include *Chrysopogon fulvus*, *Heteropogon contortus*, *Eremopogon foveolatus*, *Aristida setacea*, *Balanites roxburghii*, *Cordia myxa*, *Azadirachta indica*, *Cassia fistula*, *Phoenix sylvestris* and *Dactyloctenium* species.

- b. Fauna.** Diverse groups of birds were observed in the project area. Most dominant groups were thrushes, flycatchers, tits, warblers, babblers, larks, and lapwings. Avifauna observed in the agricultural fields was dominated by green bee-eater, blue cheeked bee-eater, rufous-tailed lark, paddy field pipits and lapwings, etc. Species like painted stork, ibis, cormorant, grebe, and ducks were also observed in the agriculture fields. Other common birds observed at various places were cattle egret, house sparrow, common myna, streaked weaver bird and bank myna. As per Bird Life International database there is no IBA falling within core<sup>2</sup> zone or buffer<sup>3</sup> zone of project area. Density of mammalian species were observed to be very low. Agricultural lands provide habitat for reptiles. The project area sustains wide variety of reptiles such as spectacled cobra, common krait, Russell's kukri, common Indian monitor lizard, Indian chameleon, oriental garden lizard, Russell's viper, and various species of skinks and geckos.
- c. Critical habitat triggers.** There are no CR/EN/VU or Schedule I species (as per the Wildlife [Protection] Act, 1972) recorded during ecological surveys, and no protected area/IBA in the vicinity of the project area (within 10 km radius from the transmission line). Biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

### C. Package 3 (400 kV Transmission Lines associated with Virudhunagar Substation)

#### 1. Physical Environment

- a. Ambient air quality.** Two sampling stations (Kottur Substation and Thennampatti) have been chosen for conducting ambient air quality monitoring. From the analysis it was observed that all the AAQ parameters (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub> and NO<sub>x</sub>) are well within the national limits. High concentration of PM<sub>10</sub> was observed at Kottur Substation measuring 56.5 µg/m<sup>3</sup>, which is well within the stipulated limits (100 µg/m<sup>3</sup>) prescribed by the CPCB. Similarly, NO<sub>x</sub> concentration was 22.45 µg/m<sup>3</sup> at Kottur Substation. However, in comparison with WHO air quality guidelines 2005 (in force at time of project approval), the recorded PM<sub>10</sub> and PM<sub>2.5</sub> concentration at Kottur Substation is exceeding the stipulated limits of 50 µg/m<sup>3</sup> and 25 µg/m<sup>3</sup> respectively. To ensure air quality is not made any worse the contractors need to pay attention to dust management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.

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<sup>2</sup> The Core Zone is known as the Right of Way (RoW) which extends to 23 m on either side of the transmission line making the total length of the RoW as 46 m as per the MoEF&CC guidelines.

<sup>3</sup> The area between the ends of the RoW and the end of the 1 km extent from the proposed stretch would form the buffer zone.

- b. Ambient noise levels.** Ambient noise levels have been monitored in the same locations (Kottur Substation and Thennampatti) chosen for AAQ monitoring. The outcome of the analysis shows that for both the locations, the recorded noise levels are very high for the day and nighttime Leq. For daytime, the recorded noise level was 59.7 dB(A) and 62.1 dB(A) and for nighttime it was 62.1 dB(A) and 58.5 dB(A). The stipulated national/WHO community guideline noise levels for residential areas are 55 dB(A) for day time and 45 dB(A) for nighttime. To ensure noise levels are not made any worse the contractors need to pay attention to noise management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.
- c. Groundwater quality.** Groundwater samples have been collected from four locations (Thennampatti, Pudhupatti, Kumaragiri and Kottur Substation) along the transmission line. The collected samples were analysed for their physico-chemical parameters. From the analysis, pH values vary between 8.0 and 8.2. Electrical conductivity levels vary from 952 to 9240  $\mu\text{S}/\text{cm}$ . total dissolved solids (TDS) are found to be exceeding the permissible limit from the national IS 10500 for all locations. The total hardness ranges between 203 and 1383 mg/l, which depicts that the water is highly salty and is not potable. Chloride, sulphate, and magnesium were well within the permissible limit from the national IS 10500 for Thennampatti and Pudhupatti. In Kumaragiri, calcium was found to be 241 mg/l, which exceeds permissible limits whilst the other three locations were within the permissible limits. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that surface and groundwater quality remains in line with baseline results. During construction water quality should be monitored in line with the EMoP.
- d. Soil quality.** Soil samples were collected from four locations (Thennampatti, Pudhupatti, Kumaragiri, and Kottur Substation). Based on the analysis, the soil samples collected from the survey sites are sandy, sandy clay, and silty clay in texture. The pH value of the samples are slightly alkaline. Bulk density ranges from 4.5 to 5.9. Specific gravity is 0.6 in all locations. Calcium ranges from 0.15 to 0.22 mg/kg, magnesium ranges from 0.57 to 0.77 mg/kg, sodium ranges from 0.06 to 0.14 mg/kg, zinc ranges from 12 to 17 mg/kg, manganese ranges from 222 to 527 mg/kg, iron ranges from 801 to 4314 mg/kg, and chromium ranges from 1.2 to 6.8 mg/kg. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that soil quality remains in line with baseline results. During construction soil quality should be monitored in line with the EMoP.

## 2. Biological Environment

- a. **Flora.** Predominant land use pattern along the Package 3 transmission line is agriculture. Paddy, cotton, maize, groundnut, banana, drumstick, marigold, and other vegetables (including chilli, tomatoes, and spinach) are the major cash crops that are being cultivated. Coconut (*Cocos nucifera*) and mango (*Mangifera indica*) farms are also observed in patches along the transmission line alignment. Open scrubs are another major land use. The trees in project area attained maximum heights of 4 to 7 m. Typical grasses observed in the project area include *Chrysopogon fulvus*, *Heteropogon contortus*, *Eremopogon foveolatus*, *Aristida setacea*, *Balanites roxburghii*, *Cordia myxa*, *Azadirachta indica*, *Cassia fistula*, *Phoenix sylvestris*, and *Dactyloctenium* species.
- b. **Fauna.** Diverse groups of birds were observed in the project area. Most dominant groups were thrushes, flycatchers, tits, warblers, babblers, larks and lapwings. Avifauna observed in open scrubs was dominated by ashy prinia, drongo, green bee-eater, blue cheeked bee-eater, bushlark, rufous-tailed lark, paddy field pipits, and lapwings, etc. Species like painted stork, ibis, cormorant, grebe, and ducks were commonly observed near water bodies. Other common birds observed at various places were cattle egret, house sparrow, common myna, streaked weaver bird, and bank myna. As per Bird Life International database there is no Important Bird Area falling within core or buffer zone of project area. Due to patchy nature of dense vegetation, density of mammalian species was observed to be very low. However, common langoor, mongoose (Schedule II per the Wildlife (Protection) Act, 1972) and three-striped squirrels (Schedule IV per the Wildlife (Protection) Act, 1972) were commonly seen during survey. Open scrubs and agricultural lands provide habitat for reptiles. The study area sustains wide variety of reptiles such as spectacled cobra, common krait, Russell's kukri, common Indian monitor lizard, Indian chameleon, oriental garden lizard, Russell's viper, and various species of skinks and geckos.
- c. **Critical habitat triggers.** There are no CR/EN/VU or Schedule I species (as per the Wildlife (Protection) Act, 1972) recorded during ecological surveys, and no protected area/IBA in the vicinity of the project area (within 10 km radius from the Transmission line). Biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

**D. Package 4 (765 kV Transmission Lines Package 1 associated with Virudhunagar Substation)**

**3. Physical Environment**

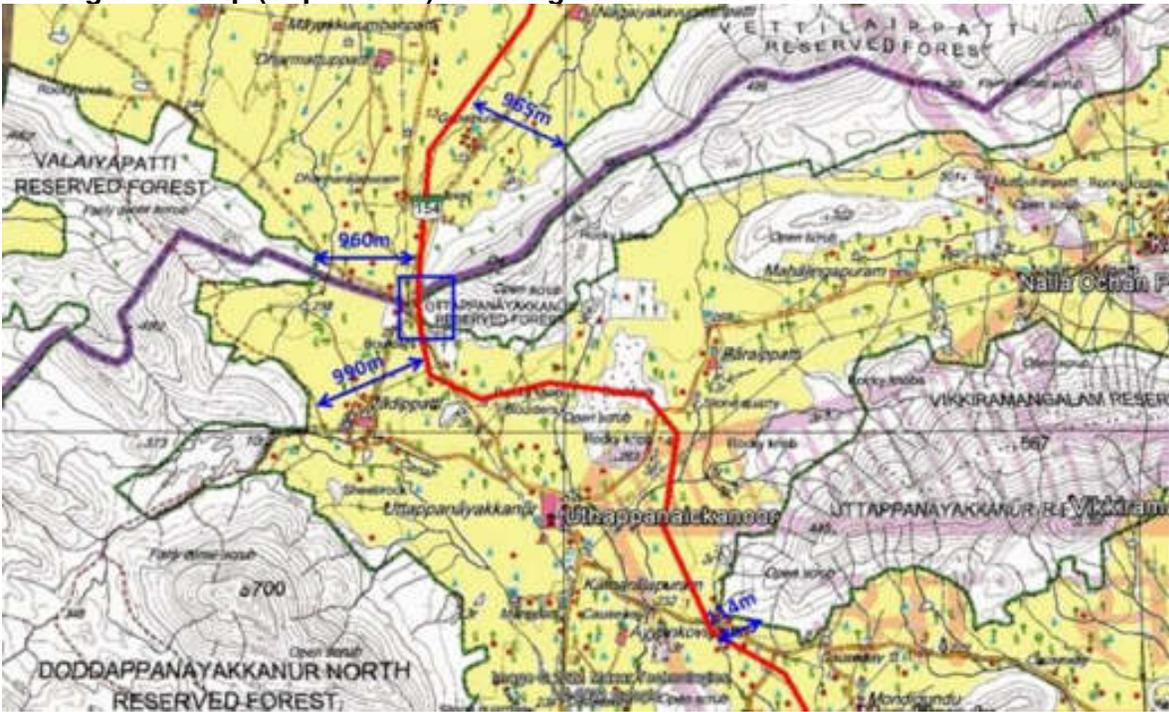
- a. Ambient air quality.** Being a continuous transmission line from Package 4, only one additional AAQ sample has been monitored at Uttappanayakanur. Concentration of the PM<sub>10</sub> was 56.2 µg/m<sup>3</sup>, PM<sub>2.5</sub> was 27.5 µg/m<sup>3</sup>, SO<sub>x</sub> was 8.6 µg/m<sup>3</sup> and NO<sub>x</sub> was 15.7 µg/m<sup>3</sup>. The observed values are less than the stipulated national limits prescribed by the CPCB. However, in comparison with the WHO air quality guidelines 2005 (in force at time of project approval), the concentration of PM<sub>10</sub> and PM<sub>2.5</sub> are exceeding the stipulated limits of 50 µg/m<sup>3</sup> and 25 µg/m<sup>3</sup> respectively. To ensure air quality is not made any worse the contractors need to pay attention to dust management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.
- b. Ambient noise levels.** Similar to AAQ, one ambient noise level monitoring survey has been conducted at Uttappanayakanur, the outcome shows nighttime noise levels are high (50 dB(A)) in comparison with the permissible limits of 45 dB(A). To ensure noise levels are not made any worse the contractors need to pay attention to noise management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.
- c. Groundwater quality.** Groundwater samples have been collected at four locations (Reddiar Patti, Genjampatti, P. Vagaikulam, and Uttappanayakanur) and analysed for their physic-chemical parameters. From the analysis, the pH values of the samples range between 7.3 and 7.7, however it is within the 6.5 to 8.5 range as stipulated in the national IS 10500 standard. Electrical conductivity levels vary from 891 to 2270 µS/cm. Total dissolved solids (TDS) are found within the permissible limit from the national IS 10500 of 580 to 1500 mg/l for all locations. The total hardness ranges between 114 and 690 mg/l. The concentration of chloride, sulphate, magnesium, calcium, and nitrate were well within the permissible limit from the national IS 10500. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that surface and groundwater quality remains in line with baseline results. During construction water quality should be monitored in line with the EMoP.

- d. **Soil quality.** Soil samples were collected at four locations (Reddiar Patti, Genjampatti, P.Vagaikulam, and Kottur SS) along the transmission line alignment. The pH value of the samples is slightly alkaline in Reddiar Patti and P.Vagaikulam. Bulk density ranges from 4.5 to 5.9. Specific gravity is 0.6 in all locations. Calcium ranges from 0.15 to 0.22, magnesium ranges from 9.8 to 29.6 mg/kg, sodium ranges from 0.03 to 0.14 mg/kg, zinc ranges from 34 to 335 mg/kg, manganese ranges from 134 to 382 mg/kg, and, iron ranges from 1078 to 5256 mg/kg. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that soil quality remains in line with baseline results. During construction soil quality should be monitored in line with the EMoP.

#### 4. Biological Environment

- a. **Flora.** The landuse pattern is dominated by agriculture. Paddy, cotton, maize, groundnut and marigold are the major crops cultivated in the project area. Vegetable like chilli, cabbage, okra, and onions are also cultivated. Open scrub is another major land use in the project area. Typical grass species of the project area includes *Chrysopogon fulvus*, *Heteropogon contortus*, *Eremopogon foveolatus*, *Aristida setacea*, and *Dactyloctenium* species. Short section of the transmission line passes through Uttappanayakkanur Reserve Forest (refer to Figure 3) for which forest clearance and compensatory reforestation is required – this was also true of the original route although not mentioned in the IEE, July 2019. The plant species that dominate the vegetation in the areas are *acacia*, *Balanites roxburghii*, *Cordia myxa*, *Capparis* spp, *Prosopis* spp, *Azadirachta indica*, *Cassia fistula*, *Diospyros chloroxylon*, *Carissa carandas*, and *Phoenix sylvestris*.

Figure 3: Map (Topo Sheet) Showing Distance of RoW from Reserve Forests



- b. Fauna.** Diverse groups of birds were observed in the project area. Most dominant groups were thrushes, flycatchers, tits, warblers, babblers, larks and lapwings. Avifauna observed in open scrub was dominated by ashy prinia, drongo, green bee-eater, blue cheeked bee-eater, bushlark, rufous-tailed lark, paddy field pipits and lapwings etc. Species like painted stork, ibis, cormorant, grebe, and ducks were commonly observed near water bodies. Other common birds observed at various places were cattle egret, house sparrow, common myna, streaked weaver bird, and bank myna. The presence of Kullur Sandai Reservoir, which is located at a distance of 4.92 km from the transmission line attracts more birds. As per the IBA records, except spot-billed pelicans (*Pelecanus philippensis*), which is in near threatened (NT) status as per IUCN red list, all other IBA bird species are in Least Concern.
- c. Critical habitat triggers.** Per the IBA citation, Kullar Sandai Reservoir is designated under IBA Criterion A1 for supporting the near-threatened spot-billed pelican but not IBA Criterion A4 in relation to congregations. Therefore, it does not qualify as Critical Habitat in terms of migratory/congregatory birds.<sup>4</sup> Apart from this reservoir IBA there are no CR/EN/VU or Schedule I species (as per the Wildlife [Protection] Act, 1972) recorded during ecological surveys, and no other protected area/IBA in the vicinity of the project area (within 10 km radius from the transmission line). Forest clearance is required, other biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

## **E. Package 5 (765 kV Transmission Lines Package 2 associated with Virudhunagar Substation)**

### **1. Physical Environment**

- a. Ambient air quality.** Three sampling stations (Perumal Koil Valasu - Poosaripatt, Salayur, and Silukkuvarpatti) have been chosen for conducting ambient air quality monitoring. From the analysis it was observed that all the key parameters (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub> and NO<sub>x</sub>) are well within the stipulated national limits. The concentration of PM<sub>2.5</sub> ranges between 18.8 and 25.3 µg/m<sup>3</sup>, PM<sub>10</sub> ranges between 44.35 and 53.85 µg/m<sup>3</sup>, SO<sub>x</sub> ranges between 4.65 and 7.15 µg/m<sup>3</sup>, and NO<sub>x</sub> ranges between 15.95 and 17.15 µg/m<sup>3</sup>. As indicated all the recorded values are less than the NAAQ standard published by the CPCB. However, in comparison with WHO air quality guidelines 2005 (in force at time of project approval), the recorded PM<sub>10</sub> and PM<sub>2.5</sub> at Perumal Koil Valasu-Poosaripatt and Silukkuvarpatti are exceeding the stipulated limits of 50 µg/m<sup>3</sup> and 25 µg/m<sup>3</sup> respectively. To ensure air quality is not made any worse the contractors need to pay attention to dust management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.

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<sup>4</sup> Critical Habitat criterion for migratory/congregatory birds are (a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

- b. Ambient noise levels.** Ambient noise levels are recorded at three locations (Perumal Koil Valasu - Poosaripatt, Salayur, and Silukkuvarpatti). From the analysis the recorded noise levels are well within the national/WHO community guideline limits for the residential zone. Day time noise levels recorded at Silukkuvarpatti (53.3 dB[A]) was almost nearing the national standard value of 55 dB(A). Similarly, the nighttime noise levels (42.0 dB[A]) was also observed to be nearing the national standard value of 45 dB(A). Contractors need to ensure that the noise levels stay within these limits during construction and monitor per the EMoP through construction.
- c. Groundwater quality.** Three groundwater sampling locations (Perumal Koil Valasu - Poosaripatt, Salayur, and Silukkuvarpatti) were chosen at which groundwater samples were collected from along the transmission line alignment. The collected samples were tested for physico-chemical characteristics. From the analysis it was observed that the taste, total hardness, chloride content, calcium content, nitrate content, and TDS exceeded the prescribed limits. High concentration of total hardness (1420 mg/l), chloride (1022 mg/l), calcium (322 mg/l) was recorded at Perumal Koil Valasu - Poosaripatt. The disagreeable taste was due to the hardness resulting due to the presence of excess calcium and magnesium salts thus increasing the chlorides and nitrates. Excess nitrate levels are attributed to the agricultural runoff and fertilizers used as much of the land is used for agriculture and farming. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that surface and groundwater quality remains in line with baseline results. During construction water quality should be monitored in line with the EMoP.
- d. Soil quality.** Soil samples were collected from three locations (Perumal Koil Valasu - Poosaripatt, Salayur and Silukkuvarpatti). From the analysis, soil texture comprised mainly of silt and clay. Bulk Soil Density ranges between 1.44 g/cm<sup>3</sup> and 1.29 g/cm<sup>3</sup>. Sodium Absorption Ratio ranges between 6.9 and 8.65 milliequivalents per liter (meq/l). Nitrate levels ranges from 21.3 mg/kg to 31.6 mg/kg. Potassium levels ranged between 21.7 mg/kg and 34.6 mg/kg. Phosphate levels in soil varied between 27.6 mg/kg and 42.4 mg/kg. Total Organic Carbon (TOC) varied between 0.27% and 0.62%. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that soil quality remains in line with baseline results. During construction soil quality should be monitored in line with the EMoP.

## 2. Biological Environment

- a. Flora.** Predominate land use type along the transmission line is agriculture and sorghum (*Sorghum bicolor*) is the major cash crop growing in the region. Other cash crops include black gram (*Vigna mungo*), green gram (*Vigna radiate*), brinjal (*Solanum melongena*), chili (*Capsicum annuum*), onion (*Allium ceiba*), paddy (*Oryza sativa*), redgram (*Cajanus cajan*), ragi (*Eleusine coracana*). Other common tree species observed along the transmission line are gum arabic tree (*Acacia nilotica*), tree of heaven (*Ailanthus exelsa*), neem tree (*Azadirachta indica*), palmyra palm (*Borassus flabellifer*), coconut tree (*Cocos nucifera*), white gulmohar (*Delonix elata*), gulmohar (*Delonix regia*), Indian mulberry (*Morinda tinctoria*), drumstick tree (*Moringa oleifera*), banana (*Musa paradisiaca*), Indian gooseberry (*Phyllanthus emblica*), madras thorn (*Pithecellobium dulce*), algaroba (*Prosopis juliflora*), swamp pea (*Sesbania grandiflora*), tamarind (*Tamarindas indica*), teak tree (*Tectona grandis*), and guava (*Psidium guajava*). None of the species are coming under threatened category.
- b. Fauna.** Diverse groups of birds were observed during the field visit and/or site survey along the transmission line alignment. Most dominant groups were drongo and Indian roller (*Coracias benghalensis*), Indian parakeet (*Psittacula krameri*), cattle egret (*Bubulcus ibis*), common crow (*Corvus splendens*), spotted munia (*Lonchura punctulata*), Indian robin (*Copsychus fulicatus*), gray francolin (*Francolinus pondicerianus*), myna (*Acridotheres tristis*), stone curlew (*Burhinus oedicephalus*) and Indian peafowl (*Pavo cristatus*), which is a Schedule I species (as per the Wildlife [Protection] Act, 1972).
- c. Critical habitat triggers.** Apart from Indian peafowl there are no CR/EN/VU or Schedule I species (as per the Wildlife [Protection] Act, 1972) being recorded during the ecological surveys. One Key Biodiversity Areas (KBA) “Palani Hills (including Kodaikanal Reserve Forest)” is located within 10 km. It is designated for ecology associated with the Western Ghats. As per the secondary information, Palani Hills (comprising Kodaikanal Reserve Forest) has influence of wild animals from the Western Ghats (which is a nationally protected area) located 50km west of the project area. The endangered fauna species include the Bengal tiger (*Panthera tigris*), Indian elephant (*Elephas maximus*), nilgiri tahr (*Nilgiritragus hylocrius*), dhole, Day’s shrew, and, Travancore Hills Thorntail Snake (<http://www.keybiodiversityareas.org/site/factsheet/45257>) as well as eight plant species. The KBA is not designated as an IBA for its birdlife. Therefore, it does not qualify as Critical Habitat in terms of migratory/congregatory birds. Other than this site, there is no protected area/IBA in the vicinity of the study area (within 10 km radius from the transmission line). Biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

**F. Package 6 (765 kV Transmission Lines Package 3 associated with Virudhunagar Substation)**

**1. Physical Environment**

- a. Ambient air quality.** Two sampling stations (Koneripatti and Melanaickarapallavalasu) were chosen for conducting ambient air quality monitoring. From the analysis it was observed that all the AAQ parameters (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub> and NO<sub>x</sub>) are well within the national limits. Concentration of PM<sub>10</sub> was observed at Melanaickarapallavalasu measuring 46.7 µg/m<sup>3</sup>, which is well within the stipulated national limits (100 µg/m<sup>3</sup>) prescribed by the CPCB. Similarly, NO<sub>x</sub> concentration was 22.8 µg/m<sup>3</sup> at Melanaickarapallavalasu. In comparison with WHO air quality guideline 2005 (in force at time of project approval), the recorded ambient quality (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub>) concentrations are well within the guidelines. Contractors need to ensure that the air quality levels stay within these limits during construction and monitor per the EMoP through construction.
- b. Ambient noise levels.** Ambient noise levels have been monitored in the same locations (Koneripatti and Melanaickarapallavalasu) chosen for AAQ monitoring. The outcome of the analysis shows that for both the locations, the recorded noise levels are very high for the day and nighttime Leq. For daytime, the recorded noise level was 57.3 dB(A) and 55.8 dB(A) and for nighttime it was 49.6 dB(A) and 51.6 dB(A). The stipulated national/WHO community noise guideline levels for residential areas are 55 dB(A) for daytime and 45 dB(A) for nighttime. To ensure noise levels are not made any worse the contractors need to pay attention to noise management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.
- c. Groundwater quality.** Groundwater samples have been collected from four locations (Koneripatti, Vanavarayanallur, Sikkarasapalayam and Melanaickarapallavalasu) along the transmission line. The collected samples were analysed for their physico-chemical parameters. From the analysis, pH values vary between 7.3 and 7.7. Electrical conductivity levels range between 662 and 1354 µS/cm. Concentration of Total Dissolved Solids (TDS) was found within the permissible limit of the national drinking water standard (IS 10500). Chloride, total alkalinity, calcium, magnesium, sulphate, nitrate, and fluoride were well within the permissible limit of the national drinking water standard (IS 10500). Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that surface and groundwater quality remains in line with baseline results. During construction water quality should be monitored in line with the EMoP.

- d. **Soil quality.** Soil samples were collected from four locations (Koneripatti, Vanavarayanallur, Sikkarasapalayam, and Melanaickarapallavalasu). Based on the analysis, the soil sample collected from the site is sandy clay loam in texture. The pH value is slightly alkaline at Koneripatti, Vanavarayanallur, and Sikkarasapalayam. Cation exchange capacity ranges between 9.2 meq% and 23.2 meq%. Electrical conductivity ranges between 77  $\mu\text{s}/\text{cm}$  and 169  $\mu\text{s}/\text{cm}$ . Bulk density ranges between 7.1  $\text{g}/\text{cm}^3$  and 14.6  $\text{g}/\text{cm}^3$ . Nitrogen ranges between 300  $\text{mg}/\text{kg}$  and 1,300  $\text{mg}/\text{kg}$ , phosphate ranges between 1040  $\text{mg}/\text{kg}$  and 3360  $\text{mg}/\text{kg}$ , potassium ranges between 0.07% and 0.13%, sodium absorption, calcium, and magnesium are observed below detectable limits (BDL). Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that soil quality remains in line with baseline results. During construction soil quality should be monitored in line with the EMoP.

## 2. Biological Environment

- a. **Flora.** Agriculture is the major land use pattern along the transmission line alignment. Paddy is the major cash crop, which is followed by onion and sorghum. Coconut farms also observed in patches along the transmission line alignment. The remaining area other than arable land is open scrub. Open scrubs exhibited scattered patches of *Prosopis juliflora*, *Leucaena leucocephala* and *Borassus flabellifer*. Common trees observed along the transmission line includes *Bombax cieba*, *Cocos nucifera*, *Delonix regia*, *Ficus benghalensis*, *Mangifera indica*, *Moringa oleifera*, *Prosopis juliflora*, *Tamarindus indicus* and *Thespesia populnea*.
- b. **Fauna.** 41 species of birds were observed in various habitats among the project area. Agricultural fields and open scrubs were dominated by dove, cuckoo/koel, larks, bee-eaters, and swallows. Accipiter like kites, falcon, and kestrel were commonly seen. Flocks of grey francolin were occasionally seen near bushes. Indian peafowl (both male and female) Schedule I species (as per the Wildlife [Protection] Act, 1972), were commonly observed in entire study area. Small birds like oriole, koel, huppoe, drongo, myna, bulbul, and babblers dominated dense vegetation. Few flocks of egrets, storks, and cormorants were observed near water bodies. Except Indian peafowl (*Pavo cristatus*), which is a Schedule I species (as per the Wildlife ([Protection] Act, 1972), all other bird species are in Least Concern status.
- c. **Critical habitat triggers.** Apart from Indian peafowl there are no CR/EN/VU or Schedule I species recorded during ecological surveys, and no protected area/IBA in the vicinity of the study area (within 10 km radius from the transmission line). Biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

**G. Package 7 (230 and 110 kV Transmission Lines associated with Ottapidaram Substation)**

**1. Physical Environment**

- a. Ambient air quality.** Two sampling stations (Lakshmipuram and Vijayapuri) were chosen for conducting ambient air quality monitoring. From the analysis it was observed that all the AAQ parameters (PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>x</sub> and NO<sub>x</sub>) are well within the national limits. Concentration of PM<sub>10</sub> was observed at Lakshmipuram measuring 52.6 µg/m<sup>3</sup>. Similarly, PM<sub>2.5</sub> (24.1 µg/m<sup>3</sup>) and NO<sub>x</sub> (24.1 µg/m<sup>3</sup>) concentration were observed. However, the observed values are well within the stipulated national limits prescribed by the CPCB. In comparison with WHO air quality guidelines 2005 (in force at time of project approval), the recorded PM<sub>10</sub> concentration (52.6 µg/m<sup>3</sup>) at Lakshmipuram is exceeding the stipulated guideline limit of 50 µg/m<sup>3</sup>, other parameters are within the guideline limits. To ensure air quality is not made any worse the contractors need to pay attention to dust management, as already stipulated in the IEE, July 2019 and monitor per the EMoP through construction.
- b. Ambient noise levels.** Ambient noise levels are recorded at two locations (Lakshmipuram and Vijayapuri). From the analysis the recorded noise levels are well within the limits for the residential zone. Daytime noise levels recorded at Lakshmipuram (53.2 dB[A]) were almost nearing the national standard/WHO community noise guideline value of 55 dB(A). Similarly, the nighttime noise levels (42.4 dB[A]) was also observed to be nearing the national standard/WHO community noise guideline value of 45 dB(A). Contractors need to ensure that the noise levels stay within these limits during construction and monitor per the EMoP through construction.
- c. Groundwater quality.** Four groundwater sampling locations (Lakshmipuram, Keezhasubramaniapuram, Bommaipuram, and Silukkuvarpatti) were chosen and groundwater samples collected along the transmission line alignment. The collected samples were tested for their physico-chemical characteristics. From the analysis it was observed that pH values vary between 8.2 and 8.3 (more towards alkaline pH). Electrical conductivity levels range between 1194 and 7748 µS/cm (showing strong presence of more ions). Concentration of total dissolved solids (TDS) ranged between 740 and 4804 which exceeds the permissible limit of the national drinking water standard (IS 10500). The concentration of chloride, sulphate, magnesium calcium, and nitrate were exceeding the permissible limit of the national drinking water standard (IS 10500) in Lakshmipuram and Keezhasubramaniapuram. However, in Bommaipuram and Silukkuvarpatti, the concentration of chloride, sulphate, magnesium calcium, and nitrate are well within these limits. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that surface and groundwater quality remains in line with baseline results. During construction water quality should be monitored in line with the EMoP.

- d. **Soil quality.** Soil samples were collected at four locations (Lakshmipuram, Keezhasubramaniapuram, Bommaipuram, and Kamanaickanpatti) along the transmission line alignment. The pH value of the sample from Lakshmipuram is slightly alkaline. Bulk density ranges from 1.43 to 1.53. Specific gravity ranges between 2.36 and 2.64. Calcium ranges from 92 to 151 mg/kg, magnesium ranges from 32 to 60 mg/kg, sodium ranges from 219 to 312 mg/kg, zinc ranges from 22.6 to 368 mg/kg, manganese ranges from 78.62 to 116.3 mg/kg, and iron ranges between 0.61 and 0.91 mg/kg. Contractors need to pay attention to pollution prevention and control measures as already stipulated in the IEE, July 2019 so that soil quality remains in line with baseline results. During construction soil quality should be monitored in line with the EMoP.

## 2. Biological Environment

- a. **Flora.** 37 tree species were recorded in the study area. The flora species were dominated by *Prosopis juliflora*, *Borassus flabellifer* and *Calotropis gigantea*. Water lilies (*Nymphoides indica*), bermuda grass and *Eichhornia crassipes* were commonly observed along water bodies. Water-logged areas tend to be over-run by a dense growth of *Typha angustata* and *Eichhornia crassipes* in some places. Cultivations of banana, coconut, and drumstick were dominant in the agricultural area. Paddy is the major cash crop, which is followed by onion and sorghum. Coconut farms were also observed in patches along the transmission line alignment.
- b. **Fauna.** 62 species of birds were observed in various habitats among the project area. Avifauna near the surface water bodies are dominated by cormorants, ibis, ducks, and painted storks. Two species of kingfishers were recorded near lakes. Redshanks and ibis were occasionally seen near small streams discharging into lakes. The Bommaipuram Lake was recorded as the most eco-sensitive habitat in the project area. The water body and dense vegetation around was providing suitable ground for roosting and breeding of water birds like painted stork, pelicans, cormorants, and sand pipers. Raptors like black kite, Brahminy kite were also observed in the lake. Agricultural fields and open scrubs were dominated by dove cuckoo/koel, larks, bee-eaters, and swallows. Accipiter like kites, falcon, and kestrel were commonly observed. Indian peafowl (both male and female) Schedule I species (as per wildlife [Protection] Act, 1972), were commonly observed in the project area. Small birds like oriole koel, huppoe, drongo, myna, bulbul, and babblers dominated the dense vegetation. Due to patchy nature of vegetation, density of mammalian species in this project area was observed to be very low. Snakes like Indian cobra and Russels viper are common in this region. Common langoor, mongoose (Schedule II per the Wildlife [Protection] Act, 1972), three-striped squirrels (Schedule IV per the Wildlife [Protection] Act, 1972), and checked keel back were observed during the survey. Except Indian peafowl (*Pavo cristatus*), which is a Schedule I species (as per the Wildlife [Protection] Act, 1972), all other bird species are in Least Concern status.

- c. **Critical habitat triggers.** Apart from Indian peafowl there are no CR/EN/VU or Schedule I species recorded during ecological surveys, and no protected area/IBA in the vicinity of the study area (within 10 km radius from the transmission line). Biodiversity measures already stipulated in the IEE, July 2019 remain applicable based on the additional baseline information which has been obtained.

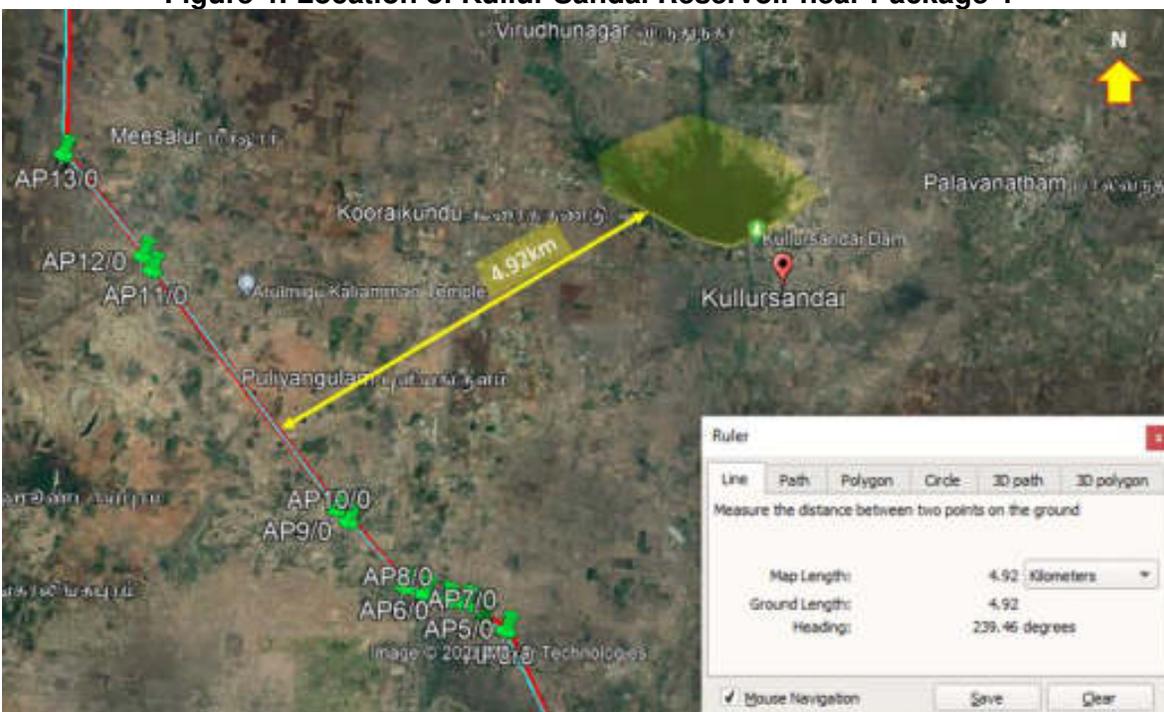
**10. Integrated Biodiversity Assessment Tool (IBAT).** In addition to ecological field surveys, additional IBAT study has been conducted for the transmission lines that have undergone major changes in the alignment. Accordingly, Packages 3, 4, 5, and 6 have been chosen for conducting the IBAT study. The IBAT tool has been utilised to identify and to assess the existing biodiversity for Package 3 (400 kV Transmission Lines associated with Virudhunagar) and 765kV Transmission Line (Virudhunagar – Coimbatore) by covering all three stretches (Package 4, 5, and 6) that have been realigned even though only major realignment is only associated with Package 5. As per MoEF&CC (wildlife division), Guidelines for Eco-Sensitive Zones around Protected Areas (including National Parks and Wildlife Sanctuaries), Reference number F.No.1-9/2007 WL-I (pt) dated 9 February 2011, a buffer of 10 km is to be maintained as an Eco-Sensitive Zone. Accordingly various buffers (10 km, 25 km, and 50 km) have been adopted to assess the key biodiversity features of the project area (for Packages 3-6) that could potentially cause critical habitat to be triggered. Eco-sensitive areas (Key Biodiversity Areas [KBA], IBAs, Protected Areas, National Parks and Wildlife Sanctuaries) falling within a 10 km buffer of the transmission lines have been identified and the status of flora and fauna populations considered for Packages 3, 4, 5, and 6.

- (i) **Package 3 (400 kV Transmission Lines associated with Virudhunagar).** As per the IBAT assessment, none of the eco-sensitive areas are falling within a 10 km buffer from the transmission line. The presence of two protected areas is in the buffer of 50 km from the transmission line viz. (i) Gulf of Mannar and (ii) Western Ghats. Except Kullur Sandai Reservoir, which is located at 25 km, all other key biodiversity areas including (i) Chitragudi and Kanjirankulam Bird Sanctuary, (ii) Kalakad-Mundanthurai Tiger Reserve, (iii) Kunthangulam Bird Sanctuary, (iv) Melagiris, (v) Srivilliputhur Wildlife Sanctuary and (vi) Watrap Periakulam, and (vii) Virakasamuthrakulam are located at 50 km distance (refer to **Appendix 3**). None of the IBAT listed IUCN CR/EN/VU species were identified during ecology surveys.
- (ii) **Package 4 (Reach I).** From the outcome of the study, it was noted that one KBA “Kullur Sandai Reservoir” is located within 10km. Other KBAs including Palni Hills (including Kodaikanal Reserve Forest) and Srivilliputhur Wildlife Sanctuary are located at a distance of 25 km. The Berijam (Kodaikanal), Chitragudi and Kanjirankulam Bird Sanctuary, Poomparai and Kukkal, Shola around Kodaikanal, Theni Forest Divisions, Vandivoorand Kunnathur Tanks (Madurai), Watrap Periakulam, and Virakasamuthrakulam are located at a distance of 50 km (refer to **Appendix 4**). None of the IBAT listed IUCN CR/EN/VU species were identified during ecology surveys.

**Kullur Sandai Reservoir.** As indicated in **Figure 4**, the distance between the transmission line and the Kullur Sandai Reservoir is 4.92 km, which is occupied by the presence of settlements including Sulakkari, Kooraikundu, Virudhunagar, Solakar, Puliyangudigulam, Chinnathampati, Periyathampatti, and Alapuram, plus National Highway 44 which traverses between the transmission line and Kullur Sandai Reservoir. Kullur Sandai Reservoir is not a Protected Area

(national park or wildlife sanctuary) of the Government of India and so it does not legally require the regulatory 10 km buffer as an eco-sensitive zone to be applied. However, as a KBA it is considered ecologically sensitive for the purposes of assessment, because it is designated as an IBA for holding a significant number of the IUCN globally near-threatened spot-billed pelicans (*Pelecanus philippensis*). This KBA/IBA also harbours several other bird species during winter, such as, the little grebe (*Tachybaptus ruficollis*), common coot (*Fulica atra*), northern shoveller (*Anas clypeata*), gadwall (*Anas strepera*), spot-billed duck (*Anas poecilorhyncha*), little cormorant (*Phalacrocorax niger*), Indian shag (*Phalacrocorax fuscicollis*) painted stork (*Mycteria leucocephala*), little egret (*Egretta garzetta*), and greater flamingo (*Phoenicopterus ruber*) -- some of these species will be at risk of collision with transmission lines during migrations.

**Figure 4: Location of Kullur Sandai Reservoir near Package 4**

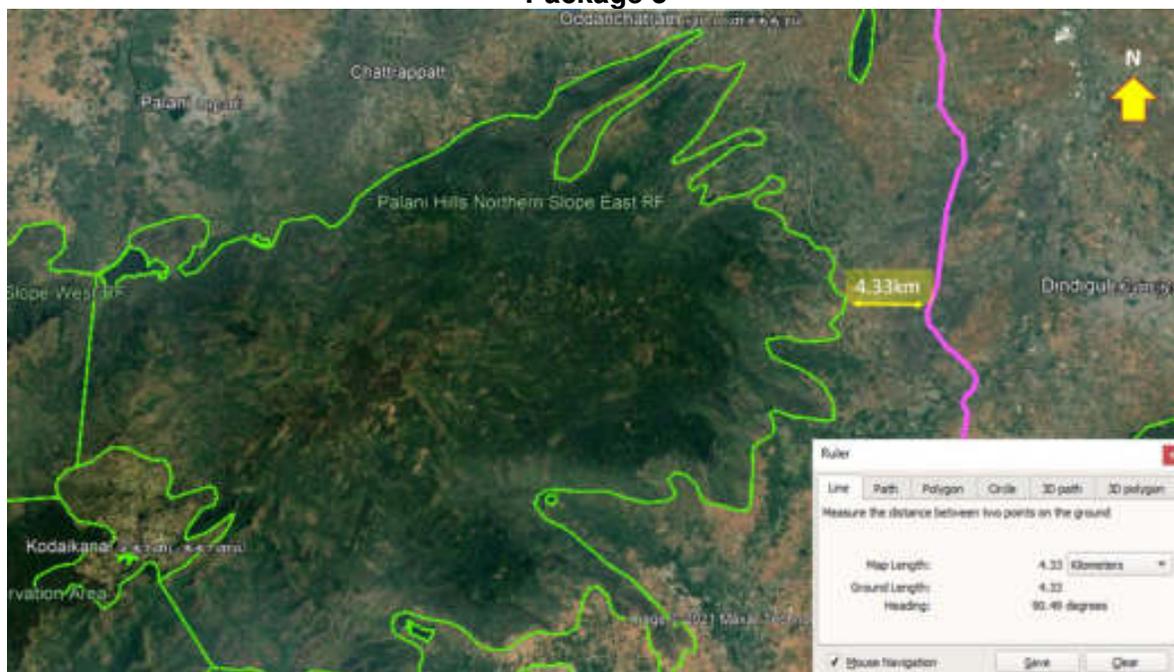


- (iii) **Package 5 (Reach II).** From the outcome of the IBAT study it was noted that one KBA “Palani Hills (including Kodaikanal Reserve Forest)” is located within 10 km. This KBA has not been designated as an IBA for its birdlife. Other KBAs including (i) Berijam (Kodaikanal), (ii) Indira Gandhi Wildlife Sanctuary and National Park, (iii) Poomparai and Kukkal, (iv) Shola (grove) around Kodaikanal, (v) Srivilliputhur Wildlife Sanctuary, (vi) Theni Forest Divisions and (vii) Vandivoor and Kunnathur Tanks (Madurai) are located at 50 km distance. Western Ghats a Protected Area is also located at a distance of 50 km (refer to **Appendix 5**). None of the IBAT listed IUCN CR/EN/VU species were identified during ecology surveys.

**The Palani Hills (including Kodaikanal Reserve Forest).** As indicated in the location map (**Figure 5**), the distance of the reserve forest boundary from the 765 kV transmission line (Reach 2) is 4.33 km. However, the distance has been occupied by the presence of settlements including Dharumathupatty, Kandhasamy

Puram, Anumantharayan Patti, Palayakannivadi, and Palayakannivadi. State Highway 33 traverses between the reserve forest and the transmission line alignment. Palani Hills is not a nationally Protected Area (national park or wildlife sanctuary) and it does not legally require the 10 km buffer as an eco-sensitive zone. This KBA has threatened species like Bengal tiger, Indian elephant, Indian leopard, gaur (wild ox), Nilgiri tahr, and grizzled giant squirrel. Endemic species of amphibians like *Raorchestes dubois*, *Ghatixalus asterops*, *Micrixalus nigriventris*, *Indirana leptodactyla*, *Nyctibatrachus deccanensis*, and reptiles like *Salea anamallayana*, *Hemidactylus anamallensis*, *Kaestlea palnica*, *Kaestlea travancorica*, *Ristella rurkii*, *Platyplectrurus madurensis*, *Teretrurus rhodogaster*, *Uropeltis pulneyensis*, *Uropeltis broughami*, *Uropeltis woodmasoni*, *Ahaetulla dispar*, *Boiga dightoni*, and *Trimeresurus macrolepis* are observed. The Pambar Shola (grove) in the Palani Hills includes several rare and endemic plant species. Endemic herbs includes *Sonerila pulneyensis*, *Hoya wightii* ssp. *Pulneyensis*, *Plectranthus bourneate*, *Trichoglottis tenera*, Shrubs including *Phyllanthus chandrabosei*, *Uleria salicifolia*, *Aeschynanthus perrottetii*, *Exacum anamalayanum*, *Aeschynanthus perrottetii* (climbing shrub), Fern including *Huperzia* sp, *Selaginella* sp. Tree species including *Psydrax Fuciformis*, *Elaeocarpus blascoi*, *Cyathea crinite* (tree fern), *Actinodaphne bourneae*, *Ceropegia thwaitesii*, *Pimpinella pulneyensis*, and *Exacum anamallayannum*. But the forest habitat which supports these species will not be impacted, and is ecologically distinct to the agricultural habitat which the transmission line passes through.

**Figure 5: Location of Palani Hills (comprising Kodaikanal Reserve Forest) near Package 5**



- (iv) **Package 6 (Reach III).** From the outcome of the IBAT study, there are no KBA or Protected Areas within a 10km buffer from the project area. However, within a 50km buffer there are six Key Biodiversity Areas, which includes (i) Erode Forest

Division, (ii) Indira Gandhi Wildlife Sanctuary and National Park, (iii) Palni Hills (including Kodaikanal Reserve Forest), (iv) Poomparai and Kukkal, (v) Sathyamangalam Forest Division (part) and (vi) Talaimalai Reserve Forest (refer **Appendix 6**). None of the IBAT listed IUCN CR/EN/VU species were identified during ecology surveys.

#### IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION

##### A. Background

11. This section assesses and presents a comparative analysis of impacts with and without changes in the transmission line alignment and a description of the adjustment required in mitigation measures in light of the revised transmission line alignments. The changes include diversion of the transmission line alignments and changes in the number of and tower locations. As indicated in Chapter 2 (Section B – Revised Transmission Line Alignments), major alignment changes are only in Package 3<sup>5</sup> and Package 5. For other packages, minor changes with respect to the number and positioning of the towers are proposed.

##### B. Impacts and Mitigation Measures

12.

**Table 4** presents the stage-wise (pre-construction, construction, and operation) comparative analysis of impacts with and without changes in transmission line alignments and a description of the adjustment in mitigation measures in light of the revised transmission line alignments. Most of the impacts associated with physical, biological, and socio-economic environments will be similar to those already considered in the IEE, July 2019 so only those that significantly differ are presented. In addition to environmental impacts, appropriate compensation is to be given for the revised loss of private land and/or crops as per the provisions given in the Resettlement Plan, August 2021.

**Table 4: Comparative Analysis of Impacts with and Without Changes in the Transmission Line Alignment**

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
<b>Package – 1</b>				
Design Changes	For the proposed 400 kV transmission line alignments from Kamuthi to Ottapidaram and Udangudi to Ottapidaram no major alternative routes were considered necessary based on the originally predicted impacts.	Though there is no major change in the transmission line alignment and thus predicted impacts there are minor deviations at certain stretches of the initially proposed transmission line and changes in the number of towers due to administrative and	For SS although there are no design changes it is suggested to allocate sufficient area for greenbelt development. The contractor will design the same and it will be approved by TANTRANSCO. For other anticipated impacts, no modification of	Package 1 to adopt the original EMP as well as supplement in this addendum.

<sup>5</sup> Initially the transmission line was proposed to terminate at Kayathar Substation from Virudhunagar Substation (72 km) but during project implementation, due to techno-economic reasons, TANTRANSCO has proposed to terminate the line at a Common Point of AP 45 of Existing 400 kV Line from Kayathar Substation to Thennampatti Substation.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
		social issues. Impacts remain similar to those originally predicted.	mitigation measures required, the suggested EMP in the IEE (contract document) remains as valid.	
Provision for bird flappers/diverters near water bodies etc.	Locations for the bird flappers were not included in the IEE.	<p>Bird diverters are recommended to avoid collision of birds with the transmission line. The following locations should be provided with bird flappers<sup>6</sup></p> <p>i. 400 kV D/C from Kamuthi to Ottaidaram Stretches: AP10 to AP11, AP12, AP27, AP33 to AP34, AP38 to AP39, and AP67.</p> <p>ii. 400 kV D/C from Udangudi to Ottapidaram Stretches: AP1 to AP6, AP10, AP13 to AP14, AP20 to AP23, AP31 to AP35, AP43 to AP44, and AP50 to AP53.</p>	Provision for the same to be included in the project cost.	
<b>Package – 2</b>				
Design Changes	There is no location or design changes in the proposed	n/a	For SS although there are no design changes it is suggested to allocate sufficient	Package 2 to adopt the original EMP as well as

<sup>6</sup> Bird diverters are to be installed on the entire length of the transmission line between these angle points unless stretches for installation are further refined by the contractor following further desk study and/or ornithological surveys (if requested) and with the clearance of ADB. Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be agreed with TANTRANSOCO and ADB.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
	substation at Virudhunagar.		area for greenbelt development. The contractor will design the same and it will be approved by TANTRANSCO. For other anticipated impacts, no modification of mitigation measures required, the suggested EMP in the IEE (contract document) remains as valid.	supplement in this addendum.
<b>Package – 3</b>				
Design Changes	Initially the transmission line was proposed to terminate at Kayathar Substation from Virudhunagar Substation (72 km) -- no major alternative routes were considered necessary based on the originally predicted impacts.	However, due to techno feasibility and economic analysis reasons, TANTRANSCO has proposed to terminate the transmission line at a common point of Angle Point (AP) 45 of an existing 400kV transmission line from Kayathar substation to Thennampatti substation. Despite the revised route impacts remain similar to those originally predicted as the length of the transmission line alignment is reduced, and it is located sufficiently far from the settlements.	For anticipated impacts, no modification of mitigation measures required, the suggested EMP in the IEE (contract document) remains as valid.	Package 3 to adopt the original EMP as well as supplement in this addendum.
Provision for bird flappers/diverters	Locations for the bird flappers were	Bird divertors are recommended to avoid collision of	Provision for the same to be included in the project cost.	

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
near water bodies etc.	not included in the IEE.	birds with the transmission line. The following locations should be provided with bird flappers <sup>7</sup> AP4 to AP10, AP11 to AP14, AP36 to AP39 and AP55 to AP57.		
<b>Package – 4</b>				
Design Changes	The original alignment of the transmission line was passing 650 m within the Uttappanayakkanur Reserve Forest area. <sup>8</sup> Other than this unanticipated impact, no major alternative routes were considered necessary based on the originally predicted impacts.	The transmission line was realigned by shifting a few of the towers to reduce the length of the transmission line through Reserve Forest to only 120m. Due to this nearly 530m of the transmission line passing through the Reserve Forest was avoided. Locating towers in the Reserve Forest has also been avoided. Otherwise impacts remain similar to those originally predicted.	The proposed transmission line alignment traverses for a length of 120m in the Uttappanayakkanur Reserved Forest for which forest clearance has to be obtained. Accordingly, TANTRANSCO have submitted the Form B application to the Divisional Forest Office, the clearance for the same is awaited.  For other anticipated impacts, no modification of mitigation measures required, the suggested EMP in the IEE (contract	Package 4 to adopt the original EMP as well as supplement in this addendum.

<sup>7</sup> Bird diverters are to be installed on the entire length of the transmission line between these angle points unless stretches for installation are further refined by the contractor following further desk study and/or ornithological surveys (if requested) and with the clearance of ADB. Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be agreed with TANTRANSCO and ADB.

<sup>8</sup> The impact of the initial design on the Uttappanayakkanur Reserved Forest was not recognized by the IEE, July 2019 – presence of the forest land was subsequently identified and through the alternate design impacts on it have been reduced as far as practical.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
			document) remains as valid.	
Provision for bird flappers/diverters near water bodies etc.	Locations for the bird flappers were not included in the IEE.	Bird divertors are recommended to avoid collision of birds with transmission line. The following locations should be provided with bird flappers <sup>9</sup> AP11/1 to AP2, AP18 to AP18/3, AP33 to AP34, AP36/1 to AP36/2, AP48/2 to AP48/6, AP50 to AP51, AP53 to AP55, AP56/2 to AP57, AP68 to AP70 (Forest area), AP75 to AP78 (Forest area), and AP83/3 to AP84	Provision for the same to be included in the project cost.	
<b>Construction Stage Impacts</b>				
Flora and fauna	Impact on the floral (trees, shrubs etc.) and fauna population in the Uttappanayakkanur Reserve Forest due to project activity and vegetation clearance.	Reduced impacts on floral and fauna population of Uttappanayakkanur Reserve Forest, there are no towers proposed within the forest land, however, the transmission line will cross over it requiring clearance of vegetation in the right of way for stringing and safety reasons for which	The conditions mentioned in the forest clearance must be included in the EMP and followed while performing the construction activities within the forest area.  Construction trucks and equipment will move only in the designated right of way without	

<sup>9</sup> Bird diverters are to be installed on the entire length of the transmission line between these angle points unless stretches for installation are further refined by the contractor following further desk study and/or ornithological surveys (if requested) and with the clearance of ADB. Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be agreed with TANTRANSOCO and ADB.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
		forest clearance is being obtained.	<p>affecting the rest of the reserve forest area.</p> <p>All generated construction wastes must be removed on the same day from the Uttappanayakkanur Reserved Forest.</p> <p>Illegal cutting of trees (by the contractor/contractor labours) in the forest area to be prohibited, for which a continuous surveillance is to be arranged.</p> <p>Noise generating equipment like diesel generating set must have acoustic enclosures. These will not be installed within 500m area of reserve forest. Noise generating activities must not be permitted during night.</p> <p>Hunting of wild animals in the forest area by the construction labours must be avoided for which surveillance measures need to be implemented</p>	
<b>Package - 5</b>				

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
Design changes	The proposed transmission line alignment was 85 km and it had 68 angle points. The transmission line traversed Thovar Reserve Forest, water bodies, highways, and railway lines.	The revised transmission line alignment is now 94.544 km and it has 120 angle points. However, it now avoids the forest area. <sup>10</sup> Otherwise it still traverses through water bodies, highways, and railway lines and impacts remain similar to those originally predicted.	<p>Impacts on the forest area have been avoided:</p> <ul style="list-style-type: none"> <li>No forestry clearance for diversion of forest land is required</li> <li>Compensatory afforestation and plantation for the loss of forest trees (if any) due to the construction of towers within the Reserved Forest by the forest department is not required.</li> </ul> <p>For other anticipated impacts, no modification of mitigation measures required, the suggested EMP in the IEE (contract document) remains as valid.</p>	Package 5 to adopt the original EMP as well as supplement in this addendum.
Provision for bird flappers/diverters near water bodies etc.	Locations for the bird flappers were not included in the IEE.	Bird diverters are recommended to avoid collision of birds with transmission line. The following locations should be provided with bird flappers <sup>11</sup>	Provision for the same to be included in the project cost.	

<sup>10</sup> The impact of the initial design on the Thovar Reserved Forest was not recognized by the IEE, July 2019 – presence of the forest land was subsequently identified but through the alternate design any impacts on it have been avoided.

<sup>11</sup> Bird diverters are to be installed on the entire length of the transmission line between these angle points unless stretches for installation are further refined by the contractor following further desk study and/or ornithological surveys (if requested) and with the clearance of ADB. Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be agreed with TANTRANSOCO and ADB.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
		AP10 to AP14, AP40 to AP45 and AP90 to AP91.		
<b>Construction Stage Impacts</b>				
Spoil management (disposal of excess inert spoil due to longer length)	Construction of transmission line was 85 km.	Construction of transmission line has been extended to 94.544 km (addition of 9.544 km) increasing number of towers and thus amount of spoil generated.	The estimated spoil/construction waste from the site will be increased, hence it is suggested to find a suitable location (in consultation with local government and the community) for the disposal of the same as inert waste in accordance with the national laws and regulations.	
Flora	Impact on the floral population (trees, shrubs etc.) in the Thovar Reserve Forest may be affected due to project activity.	No impacts of floral population of Thovar Reserve Forest.	No floral population will be removed in the Thovar Reserve Forest (it has been bypassed with the help of alternate alignment).	
Fauna	Impact on the faunal population in the Thovar Reserve Forest may get affected due to project activity.	No impacts of faunal population of Thovar Reserve Forest.	No faunal population will be impacted in the Thovar Reserve Forest (it has been bypassed with the help of alternate alignment).	
<b>Package 6</b>				
Design changes	No major alternative routes were considered necessary based on the originally predicted.	Minor realignment has been proposed to avoid the towers located very close to the settlement areas. However, impacts remain similar to those originally predicted.	For anticipated impacts, no modification of mitigation measures required, the suggested EMP in the IEE (contract document) remains as valid.	Package 6 to adopt the original EMP as well as supplement in this addendum.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
Provision for bird flappers/diverters near water bodies etc.	Locations for the bird flappers were not included in the IEE.	Bird divertors are recommended to avoid collision of birds with transmission line. The following locations should be provided with bird flappers <sup>12</sup> AP3 to AP6, AP22 to AP24(24/1), AP38 to AP41, and AP89 to AP91.	Provision for the same to be included in the project cost.	
<b>Package 7</b>				
Design change	Linking the 110 kV gantry points with the substation was an issue.	Realignment has been proposed for linking the gantry points with the substation. However, impacts remain similar to those originally predicted.	For anticipated impacts, no modification of mitigation measures required, the suggested EMP in the IEE (contract document) remains as valid.	Package 7 to adopt the original EMP as well as supplement in this addendum.
Provision for bird flappers/diverters near water bodies etc.	Locations for the bird flappers were not included in the IEE.	Bird divertors are recommended to avoid collision of birds with transmission line. The following locations should be provided with bird flappers <sup>13</sup>  <u>Line A:</u> AP15 to AP18, AP19B to AP19B1 and AP23	Provision for the same should be included in the project cost.	

<sup>12</sup> Bird divertors are to be installed on the entire length of the transmission line between these angle points unless stretches for installation are further refined by the contractor following further desk study and/or ornithological surveys (if requested) and with the clearance of ADB. Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be agreed with TANTRANSCO and ADB.

<sup>13</sup> Bird divertors are to be installed on the entire length of the transmission line between these angle points unless stretches for installation are further refined by the contractor following further desk study and/or ornithological surveys (if requested) and with the clearance of ADB. Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be agreed with TANTRANSCO and ADB.

Particulars	Impacts		Modification in Mitigation Measures	Remarks
	Without Change in Alignment	With Change in Alignment		
		<u>Line B</u> : Not required  <u>Line C</u> : AP15 to AP17  <u>Line D</u> : AP20, AP24 to AP25, AP34, AP39 to AP41, AP48 to AP49, AP50, and AP57A to AP60  <u>Line E</u> : LOC13		

Source: ADB TA Consultant

Note: in some cases, the initial length and the number of APs required were incorrectly reported in the IEE, July 2019  
 SS = Substation, TANTRANSCO = Tamil Nadu Power Transmission Corporation Limited, AP = Angle Point, kV = kilovolt, IEE = Initial Environmental Examination

**13. Impact on Trees.** Estimation of the impact on trees per the IEE was for 1,655 trees to be lost. The impact on trees is now based on the inventory surveys carried out by the respective contractors along the final proposed alignment of the transmission lines. As per the estimate, total number of trees to be affected by the transmission lines is now 50,980. No trees were reported to be cut for the substation works. As far as fruit trees are concerned, these trees are not the basic source of income or livelihood and in most of the cases it is used for self-consumption rather than selling in the market. Adequate compensation for loss of trees is being provided by TANTRANSCO based on their productivity, which is also assessed by Horticulture and Agriculture department. Cutting of any forest trees will be compensated for per the Forest Department requirements, in addition to ensure no net loss of biodiversity 1:10 replacement (as suggested by the Madras High Court) should be provided, through direct planting or with support of Forest Department. Details on revised number of trees to be lost to the project are provided in Table 5.

**Table 5: Number of Trees to be Affected**

No	Name of the Transmission Lines	Length (km)	Total Trees Affected
<b>Package 1</b>			
1.	400 kV DC line Kamuthi–Ottapidaram	71.6	190
2.	400 kV DC line Udangudi–Ottapidaram	67.9	5534
<b>Package 3</b>			
3.	400 kV DC line Virudhunagar–Kayathar	70.2	208
<b>Package 4</b>			
4.	765 kV DC line Virudhunagar–Coimbatore, Reach 1	86.9	12663
<b>Package 5</b>			
5.	765 kV DC line Virudhunagar–Coimbatore, Reach 2	94.544	18706
<b>Package 6</b>			
6.	765 kV DC line Virudhunagar–Coimbatore, Reach 3	71.4	13135
<b>Package 7</b>			
7.	230 kV DC line LILO of T- Sipcot Kavanoor SC line to Ottapidaram SS	10.88	14
8.	230 kV DC line LILO of T- Sipcot Savasapuram feeder to Ottapidaram	6.23	63
9.	110 kV DC line on DC tower from LILO of TT auto-T Sipcot feeder to Ottapidaram SS	8.95	133
10.	110 kV SC line on DC tower from proposed Ottapidaram to existing Vijayapuri SS	34.41	300
11.	110 kV DC line on DC tower from LILO of Eppodhmvendran to Ottapidaram SS	3.31	34
<b>Total</b>			<b>50,980</b>

Source: TANTRANSCO 2021

**14. Safety measures for controlled blasting during excavation:** Presence of sub-surface rock does occur in the transmission line alignments. Hence, if identified during excavation, alternatives like drilling and chiselling, controlled blasting, etc., will need to be examined. Suitable technology for excavating for foundations will be identified depending upon the site conditions. Wherever controlled blasting is proposed, the following measures will be carried out for execution in a safe manner. Cost for implementation of mitigation measures and liability are the responsibility of contractor.

- a. Carryout controlled blasting in consultation with TANTRANSCO such that blasting activities generating least vibration are conducted during periods of the day which will result in least disturbance, especially near schools and other sensitive receptors.
- b. The contractor to submit a blasting plan in advance to TANTRANSCO for their approval and implement works in accordance with the plan.
- c. Permission will be obtained from the District Collector/Revenue Authority for controlled blasting for excavation and the conditions issued will be complied with during implementation.
- d. Blasting will be carried out by a licensed Explosive Contractor only.
- e. For controlled blasting, explosives including blasting caps, will be transported to the blasting site only through exclusive vehicle in safe manner in accordance with the requirements of the blasting license. After blasting is over, the balance explosives will be returned to the licensed storage.

- f. Proper prior notice will be issued to the residents before commencing construction works.
- g. Prior information will be given to Police Officials.
- h. Workers (flagman) will be stationed to warn people before firing any blasts and not to permit the traffic.
- i. When blasting, ample warning will be given to all persons within the vicinity prior to blasting. Warning signs shall be erected to a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.
- j. Contractor will ensure necessary precautions / protection (like excavated earth, sand-filled bags, etc.) to reduce dust emissions, noise levels, and vibration. Sites will be provided with necessary shields all around.
- k. Minimum explosive will be used for control blasting for residential areas.
- l. After a blast has been fired, the Blast Control Specialist will make a careful inspection to determine that all charges have exploded before employees are allowed to return to the operation.
- m. The contractor will be responsible for any or all damages to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with use of explosives. The contractor will do the activities after obtaining the blasting permission from District Collector.
- n. For the diversion of traffic (if any) in the blasting area, the contractor will prepare a traffic management plan and obtain permission from TANTRANSCO and Traffic Police.

## V. ENVIRONMENTAL MANAGEMENT AND ENHANCEMENT

### A. Environmental Management Plan

15. This section presents the addendum to the Environmental Management Plan (EMP) for the CKIC Power Sector Investment Project including monitoring activities. There will not be any changes in the mitigation measures and monitoring requirements already proposed for physical, biological, and socio-economic environment impacts already identified (such as generation of dust from earthworks; noise and exhaust from operation of equipment/machinery/vehicles; generation of construction waste as well as wastes from construction and worker camps; water contamination and water supply issues; occupational health and safety issues with the workers and local communities and removal of trees, etc.) for both the substations and transmission lines for which mitigation and monitoring requirements are already included in the EMP in the IEE, July 2019 thus this EMP addendum is to be read in conjunction with it. These suggested measures will be applicable to whole CKIC Power Sector Investment Project (covering all packages) including the sections undergoing minor realignment and major realignment in the Packages 3 and 5. Specific mitigation and monitoring requirements for the revised transmission lines are provided in **Table 6**.

**Table 6: Environmental Management Plan Addendum  
(It needs to be read together with original EMP)**

<b>Project Activity</b>	<b>Potential Environment allmpact</b>	<b>Mitigation Action</b>	<b>Parameters to be Monitored</b>	<b>Standards/ Measurement/ Frequency</b>	<b>Institutional Responsibility</b>	<b>Costs and Schedule</b>	<b>Remarks</b>
<b>Design and Pre-Construction Phase</b>							
Clearance of trees for installation of transmission lines	Loss of trees including trees within the reserved forest	Obtain forest clearance for stringing of transmission lines in reserved forest land  Plant 1:10 ratio (as suggested by the Madras High Court) to balance the biodiversity loss in the project area	Transmission lines involving tree loss and passing through reserved forest will be assessed for compliance	Before commencement of works, then quarterly during construction	Contractor (supervised by TANTRANSCO)	Contractor (as per the provisions given in the project cost) prior to tree clearance	None
Installation of Bird Flappers on transmission lines	Possibility of bird collision	Installation of bird flappers on the proposed transmission line (near the surface water bodies, forest areas etc.).  The entire length of transmission line between angle points listed in the IEE addendum are to be marked, unless stretches for installation are further refined by the contractor following further desk studies and/or ornithological surveys (if requested) and with the clearance of ADB.	Monitor rights of way for evidence of bird collisions once transmission lines installed.	Monthly	Contractor (supervised by TANTRANSCO)	Contractor (as per the provisions given in the project cost) concurrently with installation of the transmission line	Refer Table 4 of IEE addendum for the bird flapper locations (angle points are taken as reference). Ongoing study of the contractor's proposals by ADB may identify additional or reduced stretches for installation in which case any revisions will be

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		The CEA guidelines on the technical specifications of bird flight diverters has to be adopted ( <a href="https://cea.nic.in/wp-content/uploads/pse_t d/2021/01/Technical Specifications for Bird Flight Diverter.pdf">https://cea.nic.in/wp-content/uploads/pse_t d/2021/01/Technical Specifications for Bird Flight Diverter.pdf</a> ).					agreed with TANTRANS CO and ADB.
Selection of sites for worker camps and storage yards for construction materials (substations and transmission lines)	Risk of workers being affected by diseases, due to lack of proper infrastructure facilities	Proper worker housing facilities, basic welfare amenities and a requirement for a healthy living condition for the workers as per the national requirements and ILO guidelines ( <a href="#">wcms 116344.pdf</a> ( <a href="#">ilo.org</a> )) will be provided. Accommodation will have arrangements for drinking water, adequate ventilation, lighting, and electricity with special attention paid to hygiene with regular cleaning of all communal areas and at least twice daily cleaning of the toilets.  The workers through the induction/training	Selected worker camps and storage yards will be assessed for compliance; for worker camps the health and safety measures to be in compliance to the Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996 and the ILO guidelines.	Before occupation of worker camps and use of storage areas, then quarterly during construction.	Contractor (supervised by TANTRANS CO)	Contractor (as per the provisions given in the project cost) prior to finalization of site for worker camp and storage yards and then an ongoing basis.	The site should be facilitated with proper water and sanitation facilities to avoid cause of any disease.

<b>Project Activity</b>	<b>Potential Environment allpact</b>	<b>Mitigation Action</b>	<b>Parameters to be Monitored</b>	<b>Standards/ Measurement/ Frequency</b>	<b>Institutional Responsibility</b>	<b>Costs and Schedule</b>	<b>Remarks</b>
		program will be sensitized about following a code of conduct and good behavior with the local population during their stay on sites for civil works.					
Setting up workers camps in village areas (along the transmission line alignment)	Misconduct of workers and friction with local communities.	Code of conduct for workers camped in villages will be prepared, communicated, and implemented. Adherence to the same shall be monitored.	Site Audits	Daily	Contractor (supervised by TANTRANSCO)	Contractor (Until workers camp on-site).	None
Design of transmission lines	Natural hazards	Ensure design uses seismic design codes for proper seismic resilience. Also ensure it can withstand cyclone strength winds since they are likely to become more frequent in the future with the climate change.	Review of detailed design.	Prior to approval of detailed design.	Contractor (supervised by TANTRANSCO)	Contractor (detailed design)	None
Construction management (substations and transmission lines)	Environmental, health and safety impacts	CEMP and H&S Plans will be prepared and implemented from the start of the works. Formulate and implement an emergency risk management plan (by the contractor).	Review of CEMP and H&S Plans.	Prior to commencement of works.	Contractor (supervised by TANTRANSCO)	Contractor (pre-construction)	None

Project Activity	Potential Environment allImpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
<b>Construction Phase</b>							
Construction Waste Disposal Management (substations and transmission lines)	To prevent littering of construction wastes by workers on site.	<p>The waste generated will be reused in the construction activities, either as a fill material or otherwise, based on its suitability of reuse to the maximum extent possible.</p> <p>Safe disposal of the extraneous material will be ensured in the pre-identified disposal locations. In no case, any construction waste will be disposed around the project locations indiscriminately.</p> <p>Burning of municipal solid waste or hazardous waste will be prohibited.</p> <p>Use of durable, long-lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated overtime.</p> <p>Provision of facilities for proper handling and storage of construction materials to reduce the amount of waste caused</p>	Maintain a record on the construction waste generation and disposal records for periodical monitoring.	Daily	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	None

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>by damage or exposure to the elements. Purchase of perishable construction materials such as paints incrementally to ensure reduced spoilage of unused materials. Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste. Use of construction materials containing recycled content when possible and in accordance with accepted standards. Facility for waste collection and its storage at site and safe transportation to the disposal sites and disposal methods at designated area shall be provided.</p>					
Removal of rocks during excavation works (transmission lines)	Increase in vibration due to the controlled blasting and associated activities.	Carryout controlled blasting in consultation with TANTRANSCO so that blasting activities with generating least vibration are conducted during period of the day which will result in least disturbance; especially	Compliance to the conditions mentioned in the permission	As per the requirements	Contractor (supervised by TANTRANSCO)	Licensed Explosive Contractor only	Logbook to be maintained for blasting operations

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>near schools and other sensitive receptors.</p> <p>Permission will be obtained from the District Collector for controlled blasting for excavation and the conditions issued will be complied with during implementation.</p> <p>Blasting will be done through a licensed Explosive Contractor only.</p> <p>Proper prior notice will be issued to the residents before commencing construction works.</p> <p>When blasting, ample warning will be given to all persons within the vicinity prior to blasting. Warning signs will be erected to a minimum of 24 hours prior to the blast time. The warning signs will state the time and date of each blast.</p> <p>Minimum explosive will</p>					

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>be used for Control Blasting for residential areas.</p> <p>The contractor will be responsible for any and all damages to property or injury to persons resulting from blasting or accidental or premature explosions that may occur in connection with use of explosives.</p> <p>The contractor will do the blasting activities after obtaining the blasting permission from District Collector.</p>					
Erection of towers and stringing (transmission lines)	Accidents to local residents during construction (civil work, stringing, etc.).	<p>The construction sites will be properly barricaded with proper signage. The contractor will deploy safety supervisor at site during the construction. Safety supervisor with the help of security guards will ensure that unauthorized persons do not have any access in barricaded area.</p> <p>While stringing along the roads or at the road crossings, the traffic will</p>	Site inspection and audits	Monthly	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	None

<b>Project Activity</b>	<b>Potential Environment allmpact</b>	<b>Mitigation Action</b>	<b>Parameters to be Monitored</b>	<b>Standards/ Measurement/ Frequency</b>	<b>Institutional Responsibility</b>	<b>Costs and Schedule</b>	<b>Remarks</b>
		be diverted to another route or will be stopped temporarily with the help of local traffic police.					
Civil and Mechanical works during tower erection (transmission lines)	Concrete waste, metal scrap waste and waste disposal on agriculture land	Although the civil works will be limited to construction of foundation and pillars for the towers, concrete waste, if any will be disposed to licensed landfill sites located at the nearest taluks. Recyclable scrap waste will be disposed through vendors by tender.	Commitment from main/sub-contractors	Daily	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	Logbook to be maintained for waste disposal.
Civil works for tower foundation near water bodies (transmission lines)	Oil spill into water bodies causing water pollution.	Although there are fewer perennial water bodies located close to the proposed T/L, care must be taken during the construction phase to avoid any spills of diesel or other construction material to avoid any contamination of river beds, soil and nearby agriculture fields; spill absorbing material must be made available at project site; oil spill collection tray will be provided at potential oil leak source if any.	Visual inspection of stock contains oil spill absorbing material and oil spill tray provided.	Daily	Contractor (supervised by TANTRANSCO)	Contractor (Entire construction phase)	Logbook maintained for oil spill, if any.

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
Construction activities near and within the forest stretches (transmission lines)	Threat due to poaching of Indian Peafowl and other wild animals by workers	<p>Adequate measures will be taken by the contractors against any threat of poaching by their workers and outsiders such as imparting knowledge through training to the workers about safety measures for wildlife and not to get involved in poaching which would be observed as an offence.</p> <p>The workers through induction/ training program will be sensitized about following a code of conduct and good behavior with the local population during their stay on sites for civil works.</p> <p>The conditions mentioned in the forest clearance will be included in the EMP and adopted while performing the construction activities within the forest area.</p>	Poaching monitoring at the site and at the labor camp to be monitored. Contractor can utilize the service of Forest Department for monitoring.	Daily	Contractor (supervised by TANTRANSCO)	Contractor (Before beginning of Construction and then ongoing)	Frequent site observation/ monitoring must be undertaken.

Project Activity	Potential Environment allImpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>Construction truck and equipment will move only in the right of way without affecting the rest of the reserve forest area.</p> <p>All construction waste generated must be removed on the same day from the Uttappanayakkanur Reserve Forest.</p> <p>Illegal cutting of trees (by the contractor/contractor labours) in the forest area prohibited, for which a continuous surveillance will be arranged.</p> <p>Noise generating equipment like diesel generating set will have acoustic enclosures. These will not be installed within 500 m area of reserve forest. Noise generating activities will not be permitted during night.</p> <p>Hunting of wild animals</p>					

<b>Project Activity</b>	<b>Potential Environment allmpact</b>	<b>Mitigation Action</b>	<b>Parameters to be Monitored</b>	<b>Standards/ Measurement/ Frequency</b>	<b>Institutional Responsibility</b>	<b>Costs and Schedule</b>	<b>Remarks</b>
		in the forest area by the construction labours will be avoided for which surveillance measures need to be implemented.					
Digging of foundation and construction works near the forest areas (transmission lines)	Fall of wild animals into the excavated pits and interference with workers	Fencing of the excavated pits for laying foundation will be done in order to avoid trapping of wild animals in the pits. Workers will be instructed not to disturb any wildlife.	Any incidence of animal fall and interference with wildlife will be recorded.	Daily	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	None
Operation of heavy machinery during excavation, if any (transmission lines)	Impact on fauna and avifauna, especially Indian Peafowl.	Operation of heavy machinery/diesel generation sets with acoustic enclosures will be done only in daytime with a special attention to avoiding noisy activity in the breeding season of Indian peafowl where present.	Noise level in dB(A) will be measured.	Monthly	Contractor (supervised by TANTRANSCO)	Contractor (during the excavation phase)	None
Erection of towers and stringing (transmission lines)	Accidents of local residents during construction (civil work, stringing, etc.).	Construction sites will be properly barricaded with proper signage. The contractor will deploy safety supervisor at site during the construction. Safety supervisor with the help of security guards where posted will ensure that	Site inspection and audits	Monthly	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	None

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>unauthorized persons do not have any access in barricaded/fenced area.</p> <p>While stringing along the roads or at the road crossings, the traffic will be diverted to another route or shall be stopped temporarily with the help of local traffic police.</p>					
Excavation works and track out (transmission lines and substations)	Noise and dust generation	<p>Use of noise reducers in heavy construction equipment. Provide temporary enclosure of noise-generating activities and equipment. Construction works will be limited to daytime only. No construction activities undertaken during the night and local communities informed of the construction schedule. Avoid prolonged exposure to noise (produced by equipment) by workers. Drivers will be instructed to avoid unnecessary use of horn.</p>	Compliance through site inspection and audits	Monthly	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	Logbook to be maintained.

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>Regular spraying of water to dust-generating areas. Covering excavated soil/dump during off-work with tarpaulin. Provide temporary enclosure of dust-generating construction area/activities. Trucks transporting construction materials that generate dust will be covered. Implement traffic management to minimize vehicular emissions. Sprinkle and cover stockpiles of loose construction materials (e.g., fine aggregates, sand). Avoid use of equipment such as stone crushers at the sites, which produce significant amount of particulate matter. Dust masks should be provided to all workers.</p> <p>All vehicles (e.g., trucks, equipment, and other vehicles that support construction works) shall</p>					

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>be well maintained and not emit dark or smoky emissions in excess of the limits. Drivers of vehicles used during construction will be under strict instructions to minimize unnecessary trips and minimize idling of engines. Dust suppression facilities (water sprayer) shall be available where earth and cement works are required.</p>					
Occupational and Community Safety (substations and transmission lines)	Accidents of the labourers, local communities during the construction (civil work, stringing, etc.).	<p>Ensure proper health and safety measures are implemented during site clearing and works to ensure no accidents.</p> <p>An experienced Health &amp; Safety (H&amp;S) Manager must be engaged by the contractor prior to start of construction. For transmission lines engage and designated H&amp;S officer (engineer) for each site (there are multiple sites) and each work area responsible to H&amp;S Manager who must</p>	Compliance through site inspection and audits; health and safety records (target of zero accidents) and records of awareness raising activities	Monthly	Contractor (supervised by TANTRANSCO)	Contractor (during the construction phase)	Logbook to be maintained. School children/ students to be included as a part of community involvement for awareness program.

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>be engaged by the construction supervision contractor prior to the start of construction of the towers for each contract/site.</p> <p>Only permitting trained and certified workers to work with any electrical equipment. Safety induction by the H&amp;S Manager should be provided for the workers. Prior to starting work, a tool box meeting should be arranged by the H&amp;S Manager for the workers. First aid box and personal protective equipment, PPE (such as helmet, safety shoes, eye protection glass, ear plugs, waist belt, mask, hand gloves, body protective apron, ear muff and insulating boots, as needed) must be provided to the workers, and ensure their use by workers. Safety signs,</p>					

Project Activity	Potential Environment allImpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>health signs, prohibition signs, warning signs, mandatory signs, emergency escape signs, first-aid signs, information signs, signboards, supplementary signboards, safety collar, symbol, pictogram, illuminated signs, acoustic signals, verbal communication and hand signals must be fitted at the designated sites of the subproject areas.</p> <p>Safety signs as needed at the tower sites.</p> <p>Safety barriers and warning signs surrounding the substation and tower construction site.</p> <p>Generators should be placed in closed rooms at substations.</p> <p>Community Involvement and Awareness Raising Program (including educating on</p>					

Project Activity	Potential Environment allImpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		electrocution risks and EMF exposure levels).					
<b>Operation Phase</b>							
Maintenance of access roads to be retained for ongoing maintenance works (transmission lines and substations)	Wear and tear due to non-usage of the access roads	Periodical maintenance work to be done for the access roads after commissioning of the transmission line. Clearance of wild growth of plants to be trimmed.  Regular weeds cleaning inside substations is required.	Easy access to the tower locations during maintenance works.	Half Yearly	TANTRANSCO	TANTRANSCO (during Maintenance Phase)	Logbook
Operation of transmission line	Impact on avifauna due to electrocution and collision  Impact on community health and safety	No significant impact on birds is envisaged and bird flappers will be installed where greatest risk present. However, due to the presence of the water bodies and forests periodical inspection of the transmission lines to be made to ensure bird flappers are intact and for reports of electrocution or collision of large birds. Broken or missing bird flappers to be replaced. If frequent observation of bird fatalities is made on unmarked sections of transmission lines, then	Transmission line route will be inspected for condition of bird flappers and avifauna mortality or decomposed body with feathers scattered in the right of way in accordance with good practice methodologies.  EMF levels will be monitored along the transmission line upon	Monthly	TANTRANSCO	TANTRANSCO (during Operation Phase)	Logbook

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>installation of bird flappers is recommended in accordance with CEA guidelines.</p> <p>ICNIRP public exposure levels for EMF are met at nearest human receptors to transmission lines.</p>	operation and results communicated to the adjacent communities.				
Maintenance of equipment, conductors and insulators (substations and transmission lines)	Oil spill over soil affecting the soil quality.	<p>O&amp;M should be done in time by experienced personnel.</p> <p>Generators at substations should be placed in the closed rooms.</p> <p>Spill absorbing material to be made available at the site of maintenance works.</p> <p>Oil spill collection tray will be provided at potential oil leak source, if any.</p> <p>Used mineral oil (no PCB) as transformer oil is considered hazardous</p>	Visual inspection of site for oil spill.	At the time of maintenance works	TANTRANSCO	TANTRANSCO (during Maintenance Phase)	Logbook.

Project Activity	Potential Environment allmpact	Mitigation Action	Parameters to be Monitored	Standards/ Measurement/ Frequency	Institutional Responsibility	Costs and Schedule	Remarks
		<p>wastes and will be handled properly based on relevant regulations and international environmental agreements such as Stockholm Convention and the Basel Convention.</p> <p>Used mineral oil will be stored in plastic drums with proper labelling.</p> <p>Disposal of excess and used mineral oil will follow the accompanying material safety data sheet.</p>					

Source: ADB TA Consultant

## **B. Environmental Enhancement**

16. The ADB Safeguard Policy Statement (2009) requires there to be “no net loss” of biodiversity as a result of the project and where possible a “net gain” in biodiversity is encouraged. Though there is a provision for paying compensation for the loss of trees to the Forest Department, the provision for the compensatory afforestation for their loss is not provided. Hence as part of the environmental enhancement, and to comply with ADB Safeguard Policy Statement (2009) requirements on “no net loss” for the loss of 50,980 trees (i.e., both patta and Government land) it is required to plant replacements at a 1:10 ratio (as suggested by the Madras High Court) to balance the biodiversity loss in the project area. TANTRANSCO and contractors will consult the Forest Department for implementing the same (including framing an appropriate monitoring mechanism for the compensatory plantation).

## **C. Environmental Reporting System**

17. All the subproject packages will continue reporting with the ongoing reporting system. TANTRANSCO through its contractors will maintain monthly progress reports on the implementation of the EMP including the additional measures included in this IEE addendum, Table 6. Any deviation from the contract requirements with respect to the EMP will be documented, corrective measures implemented, and compliance supervision and monitoring will be conducted by TANTRANSCO to ensure the project maintains in-compliance. TANTRANSCO will submit six monthly environmental monitoring reports to ADB within 30 days of each period end – June and December each year.

## **D. Grievance Redressal Mechanism**

### **1. Need for Grievance Redress Mechanism**

18. Grievance Redress Mechanism (GRM) is an integral and important mechanism for addressing and resolving the concerns and grievances of project affected people. The grievances may include concerns of affected people arising out of implementation of the project, implementation of the compensation plan for resettlement impacts as well as adverse environmental impacts. The Grievance Redressal Committee (GRC) is expected to resolve the concerns and grievances of the affected people during the project cycle.

19. The GRM should not impede access to the country’s judicial or administrative remedies. Affected persons can approach the court of law at any time and independent of the project’s grievance redress process. This includes ADB’s Accountability Mechanism whereby people adversely affected by ADB-financed projects can express their grievances, seek solutions and report alleged violations of ADB’s operational policies and procedures, including safeguard policies.

20. The GRM will not deal with matters pending in a court of law. TANTRANSCO will ensure that the affected persons and the line agencies that participate in project activities understand the role and functions of GRM of the project in resolving problems and grievances pertaining to land selection for tower base, availing the RoW for stringing and payment compensation for the losses. All the cost related to GRM will be funded by the TANTRANSCO.

### **2. Establishment of Grievance Redress Mechanism**

21. The GRM was established by TANTRANSCO in June 2020. For the smooth operation of the GRM and GRCs an operational guideline on functioning of GRM (GRC) has been prepared

in consultation with TANTRANSCO which describes the procedures and mechanism of functioning of GRCs. The structure and mechanism of functioning of GRCs mentioned in the operational guideline is based in response to implementation experience and reflects a revised GRC membership and process that is designed to better reflect social norms and community leadership preferences. The GRM consists of GRCs at two levels. The first level is handled by a GRC established at the General Construction Circle (GCC) level. The second level GRC is established at the project level and is headed by the Chief Engineer (Trichy).

### **3. Scope of Grievance Redress Mechanism**

22. The scope of the GRM is

- To examine all kinds of concerns or grievances arising out of implementation of the project, including concerns relating to the resettlement compensation, environmental concerns, or adverse project impacts, and to resolve such grievances in a transparent manner.
- GRC will not deal with matters pending in the courts of law.
- For the GRM, only members of GRC, affected people and/or representatives of affected people will be allowed to participate in the meetings and consultations for grievance redressal.<sup>14</sup>
- Decision of the GRC will be communicated to the aggrieved in writing or e-mail.

### **4. Informal Resolution of Grievances**

23. Grievances will be initially and informally handled at the site-level. The site level consultation with potential affected parties, TANTRANSCO and contractor can take place in an informal setting and no written records are required to be maintained. If the affected person is not satisfied with the remedial measures proposed by the contractor, he/she can make a formal representation to the first level GRM. The complaint can relate to either compensation payment or environmental issues.

24. For any urgent matter, in particular emergency and health and safety issues, the contractor will take note of the grievance and/or complaint and get immediately in contact with the appropriate TANTRANSCO officials. Short-term issues (e.g., dust, noise, leaks, inappropriate behaviour, conflict, etc.) may be corrected immediately, by the contractor. In case of impending damage to structures, productive assets, flora or fauna, or physical cultural resources, the contractor is required to take remedial action in consultation with TANTRANSCO supervising engineer. TANTRANSCO will make a record of the issues raised and remedial measures taken.

### **5. First General Construction Circle Level Grievance Redress Committee**

25. If grievances cannot be resolved informally at site-level, the formal first level of GRM will be triggered. They will be sorted by the respective Superintending Engineer/GCC for their eligibility, level of urgency and by nature (suggestions, comments, grievances, or complaints related to adverse impacts of the project on an individual or group, violations of law, etc.). The respective Superintending Engineer/GCC will send a formal reply to the complainant within 10 working days

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<sup>14</sup> Informal resolution of grievances before entry into the GRM and all other forms of stakeholder consultation and participation are governed by applicable provisions in the Initial Environmental Examination, July 2019 and Resettlement Plan, August 2021.

of the receipt of the grievance/complaint, to acknowledge receipt, provide the complaint's registration number, and set up the GRC meeting.

26. Most of the concerns and grievances of project affected people are expected to be addressed at the GCC level since TANTRANSCO officials at this level looks after the implementation of the project. At the first level the concerns and grievances will be addressed at the GCC level. The first level GRC involves TANTRANSCO GCC officials. i.e., GCC Madurai and GCC Coimbatore. The members of the GRC at GCC level are: Superintending Engineer in the respective GCC and a contractor's representative. The Executive Engineer and/or Assistant Executive Engineer in respective GCC will help the Superintending Engineer/GCC in addressing the grievances of affected people at this level. During the grievance redressal, the affected people can invite an elected representative of village panchayat/urban ward from his/her village/urban ward to ensure that the interest of the affected people is duly protected as per the extant compensation notification issued as per relevant Government Order.

27. The aggrieved will be informed that participation in the GRM does not limit their access to other forms of recourse, including through the legal system or raising concerns directly to ADB. However, the aggrieved should be encouraged to first attempt to resolve their complaints through the project GRM before addressing their concerns to ADB.

28. A complaint to the GCC (first) level can come from the following sources:

- Directly from the project affected people that belongs to the jurisdiction of the respective GCC.
- Complaints of affected people made to the site level official i.e., Executive Engineer, Assistant Executive Engineer, Assistant Engineer.
- Complaints of affected people made to Chief Engineer/Transmission Projects-II/Trichy or TANTRANSCO head quarter and referred to first level GRC (GCC) by second level GRC.

29. After the aggrieved affected person formally lodge the grievance at GRC in GCC, the Superintending Engineer/GCC will assign suitable TANTRANSCO official to contact the petitioner for an amicable solution of the grievance.

#### **E. Recording of complaint and grievance redress at General Construction Circle level**

30. The respective Superintending Engineer/GCC will record the complaint in a complaint database. It is suggested that the respective Superintending Engineer/GCC can designate appropriate official for record keeping and maintenance of the complaint database. Details of all meetings and inspections will be documented; minutes will be signed by all members of the GRC and annexed to the grievance's file.

31. A joint inspection be done by the relevant TANTRANSCO official with the presence of the petitioner or nominated representative of the petitioner. If the aggrieved affected persons wish, he/she can invite a representative of the village/urban ward to the joint inspection or any other consultation. Once the grievance is addressed, an action taken report (ATR) will be prepared by the GCC. Wherever possible it is suggested to take the signature of petitioner in the ATR as a proof for the future. The grievance redress at this stage shall be completed within four weeks of the complaint of the petitioner.

32. If the aggrieved party is unsatisfied with the decision at the GCC level or in case GCC Madurai/Coimbatore is unable to provide a resolution at their level, the respective Superintending Engineer/GCC will forward the case to the Chairman of the GRC (project level GRC) i.e., Chairman of GRC for further action. The respective Superintending Engineer of GCC will also forward all the documents and records of that particular case to the Chairman of the GRC. Alternatively, the affected person can also submit the case to second level GRC at project level-headed by Chief Engineer, Transmission Projects-II, Trichy if he/she is not satisfied with the redress provided by the first level GRC.

#### **F. Second (Project) Level Grievance Redressal Committee**

33. The second level GRC is at project level. The GRC at project level will be the appellate authority and will be responsible to address the unresolved complaints from the GCC (first) level. The members of the GRC at project level consist of Chief Engineer/Transmission Projects-II/Trichy, Chief Financial Controller/TANTRANSCO, and Superintending Engineer/Civil-Transmission. Acting as the Chairman of GRC, the Chief Engineer/Transmission Projects-II/Trichy will review the complaints coming directly to him from any other sources (ADB, affected people, TANTRANSCO head quarters) and will assign the complaints to the relevant GCC for the redressal. In case it is not addressed at first and second level GRC, the second level GRC can refer the matter to the District Magistrate.

34. A complaint to the GRC at project level may originate from sources inter alia the following:

- Directly from the project affected people
- Unresolved complaints of affected people from respective GCC level
- Complaints of affected people made to ADB

#### **G. Recording of complaint and grievance redress at project level**

35. A designated person in the office of Chief Engineer/Transmission Projects-II/Trichy will record the complaint in a complaint database. The records of all complaints, i.e., direct complaint from affected people, unresolved complaints from GCC level, and complaints forwarded from ADB will be recorded in the database. It is suggested that the Chief Engineer/Transmission Projects-II/Trichy can designate an official for record keeping and maintenance of the complaint database.

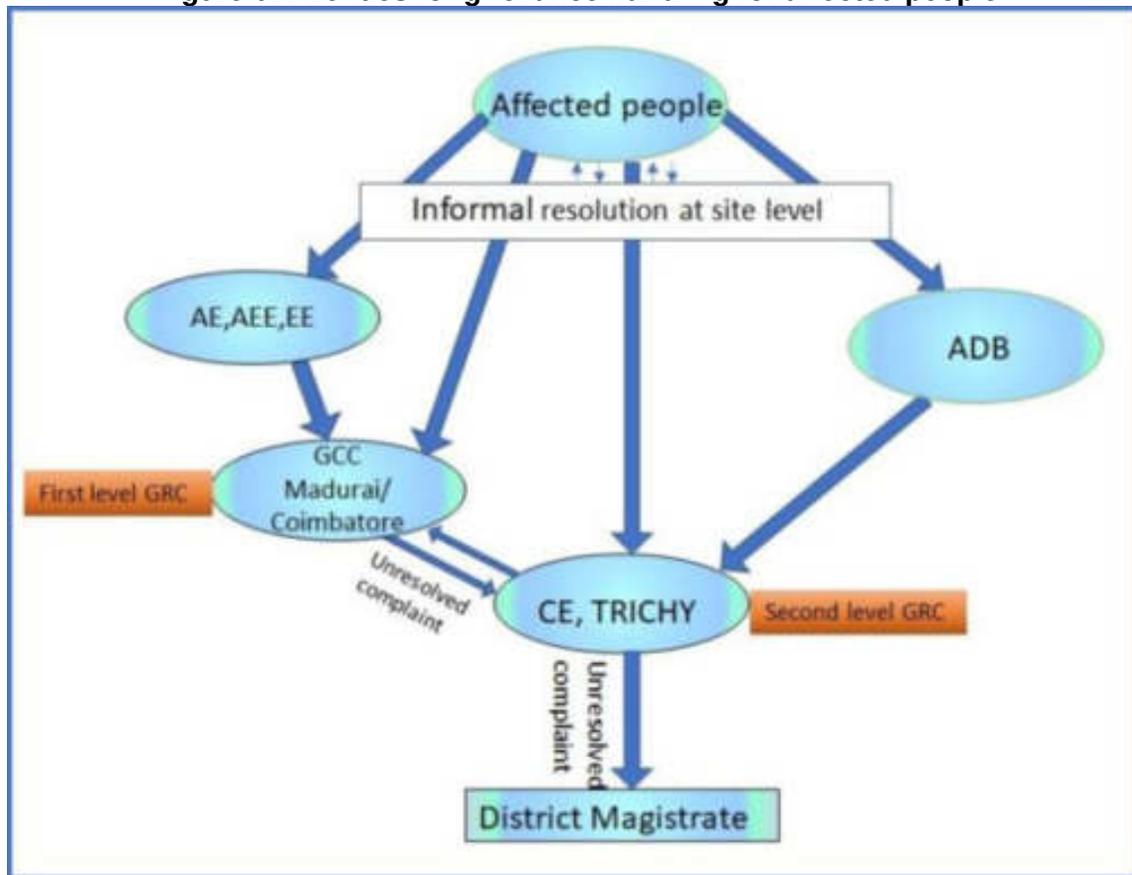
36. The GRC Chairman will review the complaints coming to him from other sources (directly from affected people, ADB) and will assign the complaints to the relevant GCC for the redressal. The process of grievance redressal will be same as mentioned in the first level GRC (GCC level) process above

37. With regard to the unresolved complaints coming from the first level GRC, the GRC Chairman will review all incoming complaints and associated documents and records and will constitute the GRC panel for redressal. The affected people (petitioner) will be contacted by the office of Chief Engineer and an amicable solution of the grievance of the affected people will be made. If needed, the committee Chairman will conduct an inspection or consultation at the site of the affected party by a TANTRANSCO official assigned for the purpose. The aggrieved AP will again be invited to nominate a representative of his/her village or urban ward to the joint inspection or any other consultation.

38. Once the grievance is addressed, an ATR will be prepared by the GRC Chairman. The grievance redressal shall be completed within four weeks of receiving the unresolved complaint from the respective GCC. In case the affected person is not satisfied with the solution provided

by GRC at project level, he/she can make a complaint to the concerned District Magistrate. The avenues for grievance handling for affected people are depicted in **Figure 6**.

**Figure 6: Avenues for grievance handling for affected people**



39. Environmental grievances will be handled in accordance with the project's GRM. Open and transparent dialogue will be maintained with project affected persons as and when needed, in compliance with ADB's Safeguard Policy Statement 2009. This GRM set up will provide an effective approach for resolution of complaints and issues of the affected persons or community and include procedures of taking and recording complaints, handling on-the-spot resolution of minor problems, taking care of complainants, and provisions of responses to distressed stakeholders, etc.

#### **H. Grievance Redressal Committee Record Keeping and Updating of Complaint Database**

40. Records of all complaints received, including address and contact details of the complainants, survey no., dates of the complaints received, details of the complaint, action taken from TANTRANSOCO, and status of the complaint will be recorded at GCC level and project level, and should ideally be shared between the two levels. The complaint database at GCC level and project level need to be updated at regular intervals. A summary of complaints received and the

outcome of grievance redressal will be included in the semi-annual safeguard monitoring reports submitted to ADB.

41. All costs incurred in GRC meetings, consultations, communication, and reporting/information dissemination will be borne by TANTRANSCO. Cost estimates for grievance redress are included in cost estimates in the compensation plan (Resettlement Plan, August 2021) under the line item of administrative cost. The complainants shall not be charged any fee for the service.

#### **I. Disclosure of Grievance Redressal Committee**

42. For the efficient functioning of the GRM, information dissemination about the existence of such GRCs shall be done by TANTRANSCO. The information on GRCs in the form of posters and banners should be displayed at appropriate places along the transmission line corridors and other places as deemed appropriate by the TANTRANSCO official. This will ensure that affected people are aware about the existence of a GRM for the redressal of grievances, if any.

43. The disclosure of information should include the email and contact number of relevant GRC members and should contain instructions on how to make a grievance. The disclosure should also have information that if the aggrieved affected person wish, he/she can invite a representative of the village panchayat/urban ward to the joint inspection or any other consultation.

44. For the transmission line corridor in the jurisdiction of GCC Madurai, the disclosure information should contain the official email address, contact number, and office address of Superintending Engineer Madurai. Similarly, for the transmission line corridor in the jurisdiction of GCC Coimbatore, the disclosure information should have the official email address, contact number, and office address of Superintending Engineer Coimbatore. The above information should be available in both English and Tamil languages.

## VI. PUBLIC AND STAKEHOLDER CONSULTATIONS

### A. Introduction

45. Successful implementation of the project requires coordinated efforts of various stakeholders at different levels. Consultations at different levels are being used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions are made. The involvement of the various stakeholders ensured that the affected population and other stakeholders are informed, consulted, and allowed to participate at various stages of project preparation and implementation.

46. Due to the ongoing COVID-19 pandemic, formal consultations (structured consultation) in the project areas could not be conducted. However, while performing the IEE updating works and alignment verification informal public consultations has been conducted to get the feedback from the local community about the project and their expectations. The schedule of the consultations is given in Table 7.

**Table 7: Public Consultation Locations and Participants**

Sl.no	Packages	Location	Date of consultation	Total number of participants
1.	Package-1 (Ottapidaram 400 kV Substation & 400 kV Transmission Lines associated with Ottapidram Substation)	<ul style="list-style-type: none"> <li>• K. Pappankulam</li> <li>• Thinmmanathathapuram</li> <li>• Ayanbommiahapuram</li> <li>• Kakarrampatti</li> <li>• Kallamoli</li> </ul>	8 and 10 April 2021	71 (68 male participants 3 and female participants)
2.	Package-2 (Virudhunagar 765/400 kV AIS Substation)	Public consultation has not been conducted for the ongoing package-2 works as there has been no change since the IEE, at which time a public consultation had been undertaken.		
3.	Package-3 (400 kV Transmission Lines associated with Virudhunagar Substation)	<ul style="list-style-type: none"> <li>• K. Mettupatti</li> <li>• Sirukulam</li> <li>• TherkuVandanam</li> <li>• Thennampatti</li> <li>• Ayyakottaiyur</li> </ul>	20 and 21 January 2021	34 (25 male participants and 9 female participants)
4.	Package-4 (765 kV Transmission lines Package-1 associated with Virudhunagar Substation)	<ul style="list-style-type: none"> <li>• Vadamalakuruchi</li> <li>• Reddiar Patti</li> <li>• Genjampatti</li> <li>• P. Vagaikulam</li> <li>• Kottur SS</li> </ul>	7 and 9 March 2021	71 (67 Male participants and 43 female participants )
5.	Package-5 (765 kV Transmission lines Package-2 associated with Virudhunagar Substation)	<ul style="list-style-type: none"> <li>• Lakshmpuram</li> <li>• Konoor</li> <li>• S Vadipatti</li> <li>• Ramakaundapatti</li> <li>• Kaligoundanpatti</li> </ul>	19 and 24 December 2020	110 (55 male participants and 16 female participants)
6.	Package-6 (765 kV transmission lines)	<ul style="list-style-type: none"> <li>• Muthukalivalasu</li> <li>• Parapalayam</li> </ul>	17 and 19 March 2021	34 (22 male participants)

	Package 3 associated with Virudhunagar Substation)	<ul style="list-style-type: none"> <li>• Sadayapalayam</li> </ul>		and 12 female participants)
7.	Package-7 (230 and 110 kV Transmission Lines associated with Ottapidaram Substation)	<ul style="list-style-type: none"> <li>• Subramaniapuram</li> <li>• Sindalakattai</li> <li>• Lakshmipuram</li> <li>• Perianatham</li> <li>• Sindalakattai</li> </ul>	24and 26 March 2021	36 (23 male participants and 13 female participants)

Source: ADB TA Consultant

## B. Consultations with Affected Communities

47. Based on the informal consultations, the feedback obtained from the communities and the project affected persons are discussed in Table 8. From the discussions it is evident that the communities are not aware of any environmental related issues that are likely during the project construction and operation, although they raised concerns about impacts on groundwater. However, the safety related issues were brought up and discussed during the consultation. It is suggested to conduct continuous consultation among the communities to bring them a confidence about the project, safety measures being adopted, and its positive socioeconomic impact in the long run.

**Table 8: Summary findings of public consultations**

Issues Discussed	People's Views and Perception
General perception about the project	Almost all villagers indicated that they were aware of the transmission line project as they saw or heard about the visit of officials during the recent detailed survey. In general, people thought that the project might help to boost the state's power supply and transmission, although it may not be of direct benefit to them. At the same time, the majority of the consultations indicated that the proposed project would ensure a greater supply of electricity to other remote regions of the country, where the availability of adequate electricity is a problem.
Support of local people for the proposed project	People from most villages agreed to provide support for the project. During the implementation of the project, they also expressed their support, especially if villagers are given job opportunities during the tower erection activities. There are certain areas (Puliamkulam, Gobalpuram villages of Madurai district; Kilangundal, Padiyaandi palayam, and Savadi Palayam villages of Tirupur district; Malaipatti and Sirukkulam villages of Virudhunagar; and Sivagananapuram village of Tuticorin) where the villagers are not in favour of the project because they are worried that their farming activities and crop production, which is their only livelihood, will be affected by the project. It was explained to the people that TANTRANSCO shall take the views of affected individuals into account and construction schedule will follow off the crop season.

<b>Issues Discussed</b>	<b>People's Views and Perception</b>
Critical issue and concern by the local people for the project	During the consultation, the majority of the villagers claimed that the construction of the tower would affect the value of their property. Furthermore, during the construction stage, agricultural and allied operations would also be affected. Farming relies more on rainfall (rain-fed lands) rather than irrigation. Therefore, there was apprehension that the disruption of farming operations and the loss of land value would have an impact on their earnings and possibly the living conditions of the household in the long term. Fear of groundwater depletion is also a major concern shared by a few villagers because of experience from other projects such as wind turbines and solar panel installations that have been introduced in the region. It was explained that there would be no permanent impact due to the project. It was informed that in addition to providing compensation for the loss of standing crops and trees, the project provides compensation of 20% of the land value under the RoW and also 100% of the land value compensation under the tower foundation. The fear of groundwater depletion is also discussed and informed that there will be no such effects due to tower installations in this project.
Criteria to be considered during project design, operation stage and construction	A few villagers expressed that the approach way to tower construction should not be destructive to their crops. Choosing of alternative routes which does not affect the crop lands is mostly preferred. It was explained that the damage of crops in the approach way would be minimum and suitable compensation will be paid for damaged crops.
Employment potential in the project	Most of the villagers suggested that local people should be involved in the job/employment opportunities during project implementation. A few of them expressed the apprehension that job opportunity may not be provided to the local villagers and it may be given to the existing workers of concerned engineering company responsible to construct the towers and transmission lines.
Compensation expected in case of loss of crops	During the consultation, most individuals expressed that they want cash compensation at the market rate level for crop loss and land loss due to tower installation and stringing. Some villagers held the opinion that they should be granted maximum compensation according to the prevailing market rate because their crop yield is valuable. It was explained that the impact on crop is minimal and the project provides compensation for the damaged crop at market rate.
Perceived loss	Most of the villagers expressed apprehension that the value of their precious farmland will be reduced due to overhead high tension line and tower installation. Some of them noted that nobody would buy the land that has towers built in the event of an emergency requirement. For households that depend on agriculture as their primary source of income, the loss of valuable farmland due to the tower base and the disruption of agricultural activities would lead to a decrease in crop yield, resulting in a decrease in household income. It was explained that 100% of the land value would be compensated for the restriction of land below the tower base and there would be no change of land ownership.

Issues Discussed	People's Views and Perception
Safety issues	<p>Most villagers have no problem regarding the safety. In some villages, villagers felt that high tension lines are not safe for human beings. A few villagers pointed out that power transmission line is not safe during rainy season; working in the agriculture field under the high tension line is often dangerous and fearful; increased heat due to high tension line; the high sound from the high tension line generates fear among the people; standing for a long time under the transmission line is thought to have a harmful effect on the body. It was informed during the consultations that all the appropriate mitigation steps would be taken into account in compliance with international safety standards.</p>

Source: ADB TA Consultant

### Snap Shots from the Public Consultations





## VII. CONCLUSIONS AND RECOMMENDATIONS

48. The changes in the transmission alignments include (i) minor deviations in the proposed transmission alignment for the Packages 1, 4, 6, and 7, (ii) major deviations in the proposed transmission alignment for Packages 3 and 5. The substations under Packages of 1 and 2 do not have any change in the scope of works. In Package 4, the proposed transmission alignment traverses through a section in the Uttappanayakkanur Reserve Forest area for which forest clearance is mandatory to secure.

49. The Packages 3 and 5 have been realigned to reduce the impact on the forest area and settlements. Due to the change in the alignment, the length of the transmission line for Package 5 has been increased from 87 km to 95 km (8 km excess). However, for Package 3, the transmission line has been terminated at a common point of AP 45 of the existing 400 kV line from Kayathar Substation to Thennampatti Substation for which an alternate alignment has been suggested.

50. Based on the changes in the transmission alignment for each package, an environmental assessment has been conducted and potential environmental impacts during the project construction and operation have been studied. The assessed environmental impacts have been compared with the IEE, July 2019 and it was observed that most of the anticipated environmental impacts and mitigation measures are already covered. However, there are few impacts and mitigation measures that are to be adopted for forest areas and supplementary environment, health and safety requirements during the project construction and operation (maintenance) which were not originally fully covered by it. Based on the presence of the surface water bodies, vegetative cover and forest areas, the locations for installation of the bird flappers as originally recommended in the EMP have also now been suggested along the transmission line alignments. For the additional mitigation and monitoring requirements identified an updated EMP (which should be considered as an addendum to the EMP given in the bid document) has been developed, Table 6, which must be adopted along with the EMP incorporated in the IEE, July 2019.

51. For all other physical, biological, and socioeconomic environment related issues such as dust, construction debris, noise, etc. the EMP provided in the disclosed IEE (July 2019) must be adopted.

52. Updates to the regulatory requirements that are mandatory for the project implementation are discussed in Chapter 2 (Section C). The indicated permissions/clearances/NOC have to be obtained prior to the start of the construction works for which the TANTRANSCO and their contractors have to be responsible in compliance of the same. As part of the reporting system the documents (permissions/clearances/NOC) obtained from the competent authority should be enclosed for reference along with the environmental monitoring reports that need to be submitted to the ADB.

53. The GRM structure, roles, and responsibilities as discussed in the IEE, July 2019 have since been modified in consultation with TANTRANSCO, accordingly the GRM arrangement has been updated and presented in this addendum, Chapter 4 (Section D), which shall subsequently be disclosed in the project sites for the better understanding of the public (as and when required).

54. Informal public consultations are conducted at the project area due to the COVID-19 pandemic situation, however, the feedback shared by the communities shows a positive response

to the project provided adequate attention is paid to compensation and safety matters during works.

## APPENDIX 1: ENVIRONMENTAL QUALITY MONITORING

### Package – 1 (Ottapidaram 400 kV Substation and 400 kV Transmission Lines associated with Ottapidram Substation)

#### a) Ambient Air Quality (24-hour Sampling)

Sl.	Location / Tower No.	PM <sub>10</sub> (µg/m <sup>3</sup> )	PM <sub>2.5</sub> (µg/m <sup>3</sup> )
1	Ottapidaram	52.6	22.7
2	Vilathikulam	51.4	20.3
3	Iyan Sengal Padai (41/0)	54	23.1
4	Kila Seithailai (47/2)	55.5	20.9
5	Kamuthi SS	52.7	23.3
6	Parunali (20/0)	54	24.7
7	Ramachandrapuram	50.9	21.7
8	Melathattaparai (79/0)	55.2	21.9
9	Dalavoipuram (67/1)	58.4	20.9
10	Meenakshipatti (57/0)	55.2	21.2
11	Eral (47/0)	54.5	23.9
<b>NAAQ Standard</b>		<b>100</b>	<b>60</b>
<b>WHO Air Quality Guideline 2005 (in force at time of project approval)</b>		<b>50</b>	<b>25</b>

#### b) Noise Quality (24-hour Sampling)

Sl.	Location/Tower No.	Day dB(A)	Night dB(A)
1	Ottapidaram	57.2	51.4
2	Vilathikulam	56.4	50.2
3	Iyan Sengal Padai (41/0)	52.8	46.4
4	Kila Seithailai (47/2)	53.7	47.2
5	Kamuthi SS	51	45.6
6	Parunali (20/0)	54.8	48.8
7	Ramachandrapuram	52	45
8	Melathattaparai (79/0)	53.2	47
9	Dalavoipuram (67/1)	48.6	42.9
10	Meenakshipatti (57/0)	50.7	44.8
11	Eral (47/0)	49	44
<b>NAAQ Standard</b>		<b>55</b>	<b>45</b>
<b>WHO Guideline Value</b>		<b>55</b>	<b>45</b>

#### c) Groundwater Quality

Sl.	Location/Tower No.	pH@ 25°C	BOD @ 27°C for 3 days (mg/l)	Dissolved Oxygen (mg/l)	E. Coli (MPN / 100 ml)	Total coliform (MPN / 100 ml)	Faecal coliform (MPN / 100 ml)
1	Ottapidaram Substation	7.94	BDL (DL: 2.0)	5.7	< 2	< 2	< 2
2	Perunali - 20/0	7.73	BDL (DL: 2.0)	5.4	< 2	< 2	< 2
3	Inyan Sangalpadi - 38/0	8.03	15.2	4.7	< 2	< 2	< 2
4	Kelaseythailai - 47/0	7.62	BDL	5.5	< 2	< 2	< 2

Sl.	Location/Tower No.	pH@ 25°C	BOD @ 27°C for 3 days (mg/l)	Dissolved Oxygen (mg/l)	E. Coli (MPN / 100 ml)	Total coliform (MPN / 100 ml)	Faecal coliform (MPN / 100 ml)
			(DL: 2.0)				
5	Melathattaparai - 79/0	7.54	12.2	4.7	< 2	< 2	< 2
6	Dalavoipuram - 67/1	7.78	16.3	4.3	< 2	< 2	< 2
7	Kurukku salai - 52/0	7.92	BDL (DL: 2.0)	5.6	< 2	< 2	< 2
8	Vilathikulam - 32/0	7.95	BDL (DL: 2.0)	5.3	< 2	< 2	< 2
9	Ramachandrapuram - 26/4	8.23	BDL (DL: 2.0)	5.5	< 2	< 2	< 2
10	Kamuthi Substation	7.34	BDL (DL: 2.0)	5.8	< 2	< 2	< 2
11	Kamuthi - 9/0	8.04	BDL (DL: 2.0)	5.4	< 2	< 2	< 2
12	Meenakshipati - 57/0	7.96	BDL (DL: 2.0)	5.9	< 2	< 2	< 2
13	Eral - 47/0	7.66	18.3	4.4	< 2	< 2	< 2
14	Nallur - 31/0	7.92	BDL (DL: 2.0)	5.8	< 2	< 2	< 2
15	Sonagin Vilai - 20/0	8.02	BDL (DL: 2.0)	5.3	< 2	< 2	< 2
16	Kallamozhi - 9/0	8.4	14.2	5.3	< 2	< 2	< 2
17	Ottaipidaram - AP72	7.95	BDL (DL: 2.0)	5.4	< 2	< 2	< 2

#### d) Soil Quality

Sl.	Location / Tower No.	Cation Exchange Capacity (meq/100g)	Chloride as Cl (mg/kg)	Conductivity @ 25°C for 3 days (µs/cm)	Moisture (%)	pH @ 25°C	Total Organic Matter (%)	Total Soluble Sulphate as SO <sub>4</sub> (mg/kg)	Total Water-Soluble Solids (mg/kg)
1	Ottaipidaram Substation	11.3	283	3210	8.7	7.56	BDL (DL: 0.04)	2370	6336
2	Ottaipidaram Substation – 72/0	3.6	159	170	24.1	7.43	0.14	755	3031
3	Perunali - 20/0	6.3	218	157.6	18.3	7.18	0.27	323	2635
4	Dalavoipuram - 67/1	11.3	165.5	38.5	20.6	7.35	0.31	2128	6522
5	Melathattaparai - 79/0	3.1	167	70.2	26.8	7.51	0.39	908	4034

6	Kurukku salai - 52/0	5.3	168	41.2	24.5	7.49	0.13	2899	9370
7	Kelaseythailai - 47/2	6.3	114	3250	15.4	7.44	0.16	2626	8797
8	Inyan Sangalpadi - 47/2	6.1	159	171.8	7.5	9.23	0.04	1591	4765
9	Vilathikulam - 32/0	6.4	279	2440	23	7.69	0.16	1516	6859
10	Ramachandrapuram - 26/4	8.4	155	39.9	28	6.6	0.34	273	2614
11	Kamuthi - 9/0	3.9	277	2650	17.7	7.32	0.16	2353	7486
12	Kamuthi Substation	5.4	157	5320	22.7	8.41	0.17	4459	11719
13	Meenakshipati - 57/0	5.5	324	2280	21.7	7.71	0.38	1356	5338
14	Eral - 47/0	6.6	214	109.6	15.4	8.38	BDL (DL: 0.04)	530	3403
15	Nallur - 31/0	4	158	2080	15.5	8.87	0.51	1645	5330
16	Sonagin Vilai - 20/0	3.3	157	60.9	9.5	8.13	0.65	786	2988
17	Kallamozhi - 9/0	18.5	529	2000	15.3	9	0.29	1871	6394

#### Package – 2 (Virudhunagar 765/400 kV Air Insulated Substation)

##### a) Ambient Air Quality (24-hour sampling)

Sl.	Location	Pollutants Concentration ( $\mu\text{g}/\text{m}^3$ )			
		PM <sub>10</sub>	PM <sub>2.5</sub>	SO <sub>2</sub>	NO <sub>2</sub>
1.	On top of scaffolding near NE Boundary	42	-	5.9	10.4
2.	On top of scaffolding near SE Boundary	34	-	5.4	10.2
3.	On top of scaffolding near SW Boundary	24	8	5.0	9.8
4.	On top of scaffolding near NW Boundary	31	-	4.1	9.5
<b>NAAQ Standard</b>		<b>100</b>	<b>60</b>	<b>80</b>	<b>80</b>
<b>WHO Air Quality Guidelines 2005 (in force at time of project approval)</b>		<b>50</b>	<b>25</b>	<b>500 (10 min)</b>	<b>200 (1-hr)</b>

**b) Noise Quality (24-hour sampling)**

Sl.	Location	Direction	Distance (m) from Substation	Sound Level Leq dB(A)
1.	Near Northeast Boundary	NE	626	47.6
2.	Southeast Boundary	SE	584	43.2
3.	Southwest Boundary	SW	483	40.6
4.	Northwest Boundary	NW	609	37.9
5.	Eastern Boundary	E	550	43.7

**For commercial category (as per national noise level standard):**

**(i) Day time noise level is 65 dB(A)**

**(ii) Nighttime noise level is 55 dB(A)**

**Indian noise levels are more stringent for commercial area with respect to WHO Guidelines**

**Package – 3 (400 kV Transmission Lines associated with Virudhunagar Substation)**

**a) Ambient Air Quality (24-hour sampling)**

Sl.	Parameters	Units	Results		Permissible Limits as per NAAQS	WHO Air Quality Guidelines 2005 (in force at time of project approval)
			Kottur SS	Thennampatti		
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	56.5	49.5	100	50
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	27.5	24.7	60	25
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	11.2	8.8	80	500 (10 min)
4	Oxides of Nitrogen (NO <sub>2</sub> )	µg/m <sup>3</sup>	22.4	16.3	80	200 (1-hr)

**b) Noise Quality (24-hour Sampling)**

Sl.	Parameters	Units	Leq		Permissible Limit as per NAAQS	WHO Guideline Value
			Kottur SS	Thennampatti		
1	Day Time	dB(A)	59.7	62.1	55	55
2	Nighttime	dB(A)	63.1	58.5	45	45

**c) Groundwater Quality**

Sl.	Parameters	Units	Results			
			Thennampatti	Pudhupatti	Kumaragiri	Kottur SS
1	Colour	HU	<1.0	<1.0	<1.0	<1.0
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	-	8.1	8.2	8.0	8.1
4	Turbidity	NTU	<0.1	26	<0.1	<0.1

Sl.	Parameters	Units	Results			
			Thennampatti	Pudhupatti	Kumaragiri	Kottur SS
5	Total Dissolved Solids(TDS)	mg/l	620	724	5990	2470
6	Total Suspended Solids (TSS)	mg/l	<5.0	6.6	<5.0	<5.0
7	Electrical Conductivity	µS/cm	952	1120	9240	3960
8	Total Hardness as CaCO <sub>3</sub>	mg/l	203	237	1383	564
9	Chlorides as Cl	mg/l	87	202	624	586
10	Total Alkalinity	mg/l	200	136	437	650
11	Calcium as Ca	mg/l	41	47	241	68
12	Magnesium as Mg	mg/l	25	29	190	96
13	Sulphate as SO <sub>4</sub>	mg/l	144	109	498	399
14	Nitrate as NO <sub>3</sub>	mg/l	<1.0	6.7	8.9	7.2
15	Fluoride as F	mg/l	<0.1	<0.1	1.0	0.8
16	Biological Oxygen Demand (BOD)	mg/l	<2.0	<2.0	<2.0	<2.0
17	Chemical Oxygen Demand (COD)	mg/l	<4.0	<4.0	<4.0	<4.0
18	Dissolved Oxygen (DO)	mg/l	5.6	8.8	3.9	4.5
19	Iron as Fe	mg/l	<0.05	<0.05	<0.05	<0.05
20	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01
21	Copper as Cu	mg/l	<0.02	<0.02	<0.02	<0.02
22	Total Coliform	MPN/100ml	2.0	<2.0	17	9

#### d) Soil Quality

Sl.	Parameters	Units	Results			
			Thennampatti	Pudhupatti	Kumaragiri	Kottur SS
1	Texture	-	Sandy Loam	Silty Clay Loam	Silty Clay Loam	Sandy Clay Loam
2	pH	-	8.4	7.9	8.0	8.0
3	Cation Exchange Capacity	meq/100g	<1.0	21	<1.0	51.3
4	Sodium Absorption Ratio (SAR)	-	<1.0	<1.0	<1.0	<1.0
5	Electrical Conductivity	µs/cm	141	66	119	640
6	Bulk Density	g/cm <sup>3</sup>	5.9	5.7	4.5	4.7
7	Specific gravity	--	0.6	0.6	0.6	0.6
8	Moisture	%	13.1	26.1	15.8	27.6
9	Nitrogen as N	%	0.07	0.07	0.08	0.04
10	Phosphate as P	%	0.9	0.8	0.9	1.2

11	Potassium as K	%	0.07	0.06	0.04	0.04
12	Calcium as Ca	mg/kg	0.15	0.18	0.18	0.22
13	Magnesium as Mg	mg/kg	0.77	0.57	0.75	0.70
14	Alkalinity as CaCO <sub>3</sub>	mg/kg	1.06	0.84	1.06	0.74
15	Chlorides as Cl	mg/kg	<0.1	0.24	<0.1	0.19
16	Sodium as Na	%	0.14	0.06	0.06	0.10
17	Total organic carbon	%	7.1	7.8	7.3	8.3
18	Zinc as Zn	mg/kg	12	17	17	16
19	Manganese as Mn	mg/kg	222	418	527	447
20	Iron as Fe	mg/kg	2404	4314	801	3687
21	Total Chromium as Cr	mg/kg	1.2	6.8	1.9	5.6

**Package – 4 (765 kV Transmission lines Package 1 associated with Virudhunagar Substation)**

**a) Ambient Air Quality (24-hour sampling)**

Sl.	Parameters	Units	Results		Permissible Limits as per NAAQS	WHO Air Quality Guidelines 2005 (in force at time of project approval)
			Kottur SS	Uttapp-anayakanur		
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	56.5	56.2	100	50
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	27.5	27.5	60	25
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	11.2	8.6	80	500(10 min)
4	Oxides of Nitrogen (NO <sub>2</sub> )	µg/m <sup>3</sup>	22.4	15.7	80	200 (1-hr)

**b) Noise Quality (24-hour Sampling)**

S. No	Parameters	Units	Leq dB(A)		Permissible Limit as per NAAQS in dB(A)	WHO Guideline Value
			Kottur SS	Uttappanayakanur		
1	Day Time	dB(A)	59.7	54.7	55	55
2	Nighttime	dB(A)	63.1	50	45	45

**c) Groundwater Quality**

Sl.	Parameters	Units	Results			
			Reddiar Patti	Genjam-patti	P. Vagaikulam	Uttapp-anayakanur
1	Colour	HU	<1.0	<1.0	<1.0	<1.0
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	-	7.7	7.7	7.5	7.3

Sl.	Parameters	Units	Results			
			Reddiar Patti	Genjam-patti	P. Vagaikulam	Uttapp-anayakanur
4	Turbidity	NTU	<0.1	<0.1	<0.1	<0.1
5	Total Dissolved Solids (TDS)	mg/l	902	580	651	1500
6	Total Suspended Solids (TSS)	mg/l	<5.0	<5.0	<5.0	<5.0
7	Electrical Conductivity	µS/cm	1369	891	1003	2270
8	Total Hardness as CaCO <sub>3</sub>	mg/l	208	226	114	690
9	Chlorides as Cl	mg/l	164	114	96	470
10	Total Alkalinity	mg/l	436	257	365	339
11	Calcium as Ca	mg/l	58	62	26	185
12	Magnesium as Mg	mg/l	15	17	12	56
13	Sulphate as SO <sub>4</sub>	mg/l	102	72	76	226
14	Nitrate as NO <sub>3</sub>	mg/l	11	2.9	4.9	11
15	Fluoride as F	mg/l	1.1	0.3	1.4	<0.1
16	Biological Oxygen Demand (BOD)	mg/l	<2.0	<2.0	<2.0	<2.0
17	Chemical Oxygen Demand (COD)	mg/l	<4.0	<4.0	<4.0	<4.0
18	Dissolved Oxygen (DO)	mg/l	5.6	6.3	5.5	4.4
19	Iron as Fe	mg/l	<0.05	<0.05	<0.05	<0.05
20	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01
21	Copper as Cu	mg/l	<0.02	<0.02	<0.02	<0.02
22	Total Coliform	MPN/100ml	90	33	90	7

#### d) Soil Quality

Sl.	Parameters	Units	Results			
			Reddiar Patti	Genjam-patti	P. Vagaikulam	Uttapp-anayakanur
1	Texture	-	Sandy Clay Loam	Silty Clay Loam	Sandy Clay Loam	Sandy Clay Loam
2	pH	-	8.6	7.9	8.7	7.7
3	Cation Exchange Capacity	meq/100g	44.4	63.4	<1.0	51.3

Sl.	Parameters	Units	Results			
			Reddiar Patti	Genjam-patti	P. Vagaikulam	Uttapp-anayakanur
4	Sodium Absorption Ratio (SAR)	meq/l	0.50	0.63	0.52	0.44
5	Electrical Conductivity	µs/cm	248	4320	505	177
6	Bulk Density	g/cm <sup>3</sup>	11.2	29.6	11.0	9.8
7	Specific gravity	-	0.67	0.71	0.59	0.6
8	Moisture	%	1.3	2.5	9.9	0.99
9	Nitrogen as N	%	0.14	0.04	0.07	0.24
10	Phosphate as P	%	0.61	0.04	0.86	0.87
11	Potassium as K	%	0.06	0.58	0.26	0.09
12	Calcium as Ca	mg/kg	5.0	23.6	14	2.8
13	Magnesium as Mg	mg/kg	1.5	8.3	5.3	0.48
14	Alkalinity as CaCO <sub>3</sub>	mg/kg	14.6	49	2.5	21.6
15	Chlorides as Cl	mg/kg	0.9	3.0	48.7	0.9
16	Sodium as Na	%	0.05	0.14	0.09	0.03
17	Total organic carbon	%	2.1	3.7	9.82	3.90
18	Zinc as Zn	mg/kg	34	115	124	335
19	Manganese as Mn	mg/kg	134	382	330	222
20	Iron as Fe	mg/kg	1078	5256	3446	1284
21	Total Chromium as Cr	mg/kg	<1.0	8.5	3.6	4.1

**Package – 5 (765 kV Transmission lines Package 2 associated with Virudhunagar Substation)**

**a) Ambient Air Quality (24-hour Sampling)**

Sl.	Parameters	Units	Perumal Kovil Valasu - Poosaripatti		Salayur		Silukkuvarpatti		NAAQS	WHO Air Quality Guidelines 2005 (in force at time of project approval)
			Max	Min	Max	Min	Max	Min		
			1	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	26.1	24.6	19.5		
2	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	55.6	52.1	46.2	42.5	55.6	52.1	100	50
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	7.8	6.5	5.0	4.3	7.8	6.5	80	500 (10 min)
4	Oxides OF Nitrogen (NO <sub>2</sub> )	µg/m <sup>3</sup>	15.2	13.2	12.6	10.5	15.2	13.2	80	200 (1-hr)
5	Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	18.6	15.7	16.7	15.2	18.6	15.7	180	-
6	Ammonia (NH <sub>3</sub> )	µg/m <sup>3</sup>	20.4	17.8	11.4	9.7	20.4	17.8	400	-

**b) Noise Quality (24-hour Sampling)**

Sl.	Station	Location	Day time dB(A)	Night time dB(A)
1	N1	Perumal Kovil Valasu - Poosaripatt	49.3	37.9
2	N2	Salayur	47.7	35.8
3	N3	Silukkuvarpatti	53.3	42
<b>NAAQ Standard</b>			<b>55</b>	<b>45</b>
<b>WHO Guidelines Value</b>			<b>55</b>	<b>45</b>

**c) Groundwater Quality**

Sl.	Parameters	Units	Perumal Kovil Valasu - Poosaripatti	Salayur	Silukkuvarpatti	IS 10500:2012 Drinking Water Specification		CPCB Designated Best Use Water Quality Criteria
						Acceptable	Permissible	
1	Salinity	ppt	2.64	1.61	1.31	0.5	2.0	-
2	Colour	HU	2	2	2	5	15	-
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	-
4	Taste	-	Disagreeable	Disagreeable	Disagreeable	Agreeable	Agreeable	-
5	Turbidity	NTU	1	1	< 1	1	5	-
6	pH @ 25°C	-	8.0	7.9	8.4	6.5-8.5	6.5-8.5	-
7	Conductivity @ 25°C	µs/cm	4210	2540	2021	-	-	-

Sl.	Parameters	Units	Perumal Kovil Valasu – Poosaripatti	Salayur	Silukkuvar- patti	IS 10500:2012 Drinking Water Specification		CPCB Designated Best Use Water Quality Criteria
						Acceptable	Permissible	
8	Total Hardness as CaCO <sub>3</sub>	mg/l	1420	995	571	200	600	-
9	Chloride as Cl <sup>-</sup>	mg/l	1022	569	386	250	1000	-
10	Total Dissolved Solids (TDS)	mg/l	2648	1618	1312	500	2000	-
11	Total Suspended Solids	mg/l	< 2	< 2	< 2	-	-	-
12	Oil & Grease	mg/l	< 2	< 2	< 2	0.5	No relaxation	-
13	P. Alkalinity as CaCO <sub>3</sub>	mg/l	16	19	29	-	-	-
14	Total Alkalinity as CaCO <sub>3</sub>	mg/l	155	165	374	200	600	-
15	Calcium as Ca	mg/l	322	249	64	75	200	-
16	Sodium as Na	mg/l	341	129	232	-	-	-
17	Potassium as K	mg/l	16	8.1	9.3			-
18	Magnesium as Mg	mg/l	150	91	100	30	100	-
19	Sulphate as SO <sub>4</sub>	mg/l	383	180	102	200	400	-
20	Nitrate as NO <sub>3</sub>	mg/l	197	179	80	45	No relaxation	-
21	Fluoride as F	mg/l	0.38	0.26	0.19	1.0	1.5	-
22	Mineral oil	mg/l	Absent	Absent	Absent	0.5	No relaxation	-
23	Iron as Fe	mg/l	0.10	0.14	0.06	0.3	No relaxation	-
24	Dissolved Oxygen	mg/l	6.8	6.9	6.9	-	-	6
25	Silica as SiO <sub>2</sub>	mg/l	64.6	70.6	87.7			-
26	Biochemical Oxygen Demand (BOD) 3	mg/l	< 2	< 2	< 2	-	-	2

Sl.	Parameters	Units	Perumal Kovil Valasu – Poosaripatti	Salayur	Silukkuvarpatti	IS 10500:2012 Drinking Water Specification		CPCB Designated Best Use Water Quality Criteria
						Acceptable	Permissible	
	days @ 27°C							
27	Chemical Oxygen Demand (COD)	mg/l	< 4	< 4	< 4	-	-	-
28	Manganese as Mn	mg/l	0.04	0.03	BDL(DL:0.01)	0.1	0.3	-

#### d) Soil Quality

Sl.	Parameters	Units	Perumal Kovil Valasu - Poosaripatti	Salayur	Silukkuvarpatti
1	Texture				
	Sand	%	27.23	28.83	7.22
	Silt	%	63.18	59.76	8.49
	Clay	%	9.59	11.41	84.29
2	pH	-	7.8	7.9	8.6
3	Moisture	%	11.58	5.09	4.68
4	Conductivity	µs/cm	406	184	244
5	Specific gravity	-	2.65	2.63	2.58
6	Bulk Density	g/cm <sup>3</sup>	1.44	1.38	1.29
7	Sodium Absorption Ratio	-	6.9	8.65	7.7
8	Water Holding Capacity	%	24.7	30.2	34.3
9	Porosity	%	28	32	38
10	Available Nitrogen	mg/kg	241	202	253
11	Nitrate Nitrogen	mg/kg	25.7	21.3	31.6
12	Available Phosphorus	mg/kg	42.4	27.6	33.5
13	Available Potassium	mg/kg	21.7	25.2	34.6
14	Calcium as Ca	mg/kg	117	78	214
15	Magnesium as Mg	mg/kg	94	47	71
16	Acidity as CaCO <sub>3</sub>	mg/kg	Nil	Nil	Nil
17	Alkalinity as CaCO <sub>3</sub>	mg/kg	692	198	890
18	Sulphate Sulphur as S	mg/kg	22.6	39.3	36.7
19	Boron as B	mg/kg	2.1	1.6	1.2
20	Chloride as Cl	mg/kg	276	207	299
21	Sodium as Na	mg/kg	417	394	512

Sl.	Parameters	Units	Perumal Kovil Valasu - Poosaripatti	Salayur	Silukkuvarpatti
22	Total Organic Carbon	%	0.27	0.42	0.62
23	Iron as Fe	%	0.71	1.78	2.26
24	Zinc as Zn	mg/kg	25.79	33.44	56.75
25	Copper as Cu	mg/kg	5.32	10.92	30.42
26	Manganese as Mn	mg/kg	96.58	185.52	410.76

**Package – 6 (765 kV Transmission lines Package 3 associated with Virudhunagar Substation)**

**a) Ambient Air Quality (24-hour Sampling)**

S. No	Parameters	Units	Results		Permissible Limits as per NAAQS	WHO Air Quality Guidelines 2005 (in force at time of project approval)
			Koneripatti	Melanaickara-pallavalasu		
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	43.2	46.7	100	50
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	21.6	24.9	60	25
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	8.5	11.6	80	500 (10 min)
4	Oxides of Nitrogen (NO <sub>2</sub> )	µg/m <sup>3</sup>	17.4	22.8	80	200 (1-hr)

**b) Noise Quality (24-hour Sampling)**

Sl.	Parameters	Units	Leq dB(A)		Permissible Limit as per NAAQS in dB(A)	WHO Guidelines Value
			Koneripatti	Melanaickara-pallavalasu		
1	Day Time	dB(A)	57.302	55.835	55	55
2	Nighttime	dB(A)	49.65	51.609	45	45

**c) Groundwater Quality**

S. No	Parameters	Units	Results			
			Koneripatti	Vanavarayanallur	Sikkarasapalayam	Melanaickara-pallavalasu
1	Colour	HU	<1.0	<1.0	<1.0	<1.0
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	-	7.5	7.3	7.6	7.7
4	Turbidity	NTU	5.6	<0.1	<0.1	0.2
5	Total Dissolved Solids (TDS)	mg/l	810	430	880	740
6	Total Suspended Solids (TSS)	mg/l	<5.0	<5.0	<5.0	<5.0

S. No	Parameters	Units	Results			
			Koneri-patti	Vanavarayanallur	Sikkarasapalayam	Melanaickarapallavalasu
7	Electrical Conductivity	µS/cm	1246	662	1354	1138
8	Total Hardness as CaCO <sub>3</sub>	mg/l	268	103	362	150
9	Chlorides as Cl	mg/l	96	139	199	260
10	Total Alkalinity	mg/l	307	239	233	399
11	Calcium as Ca	mg/l	75	48	102	58
12	Magnesium as Mg	mg/l	20	<1.0	26	4.0
13	Sulphate as SO <sub>4</sub>	mg/l	125	45	100	95
14	Nitrate as NO <sub>3</sub>	mg/l	6.1	1.0	3.8	1.0
15	Fluoride as F	mg/l	0.8	0.2	0.3	0.3
16	Biological Oxygen Demand (BOD)	mg/l	<2.0	<2.0	<2.0	<2.0
17	Chemical Oxygen Demand (COD)	mg/l	<4.0	<4.0	<4.0	<4.0
18	Dissolved Oxygen (DO)	mg/l	4.2	4.5	5.0	<0.1
19	Iron as Fe	mg/l	<0.05	<0.05	<0.05	<0.05
20	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01
21	Copper as Cu	mg/l	<0.02	<0.02	<0.02	<0.02
22	Total Coliform	MPN/100ml	3.3	34	2.0	17.0

#### d) Soil Quality

Sl.	Parameters	Units	Results			
			Koneri-patti	Vanavarayanallur	Sikkarasapalayam	Melanaickarapallavalasu
1	Texture	-	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam
2	pH	-	8.1	8.5	8.5	7.1
3	Cation Exchange Capacity	meq%	9.2	11.1	23.2	9.6
4	Sodium Absorption Ratio (SAR)	-	<1.0	<1.0	<1.0	<1.0
5	Electrical Conductivity	µs/cm	108	169	77	92
6	Bulk Density	g/cm <sup>3</sup>	9.8	14.6	10.2	7.1
7	Specific gravity	--	0.19	0.19	0.27	0.22
8	Moisture	%	2.9	2.3	0.12	2.5
9	Nitrogen as N	mg/kg	300	1200	600	1300
10	Phosphate as P	mg/kg	2700	2860	1040	3360

Sl.	Parameters	Units	Results			
			Koneripatti	Vanavarayanallur	Sikkarasapalayam	Melanaickarapallavalasu
11	Potassium as K	%	0.09	0.13	0.07	0.10
12	Calcium as Ca	mg/kg	<1.0	<1.0	<1.0	<1.0
13	Magnesium as Mg	mg/kg	<1.0	<1.0	<1.0	<1.0
14	Alkalinity as CaCO <sub>3</sub>	mg/kg	36689	41930	27930	20970
15	Chlorides as Cl	mg/kg	39131	488	3253	3174
16	Sodium as Na	mg/kg	204	481	311	379
17	Total organic carbon	mg/kg	37800	49800	53670	21140
18	Zinc as Zn	mg/kg	35	13	26	20
19	Manganese as Mn	mg/kg	121	74	187	58
20	Iron as Fe	%	0.2	0.2	0.4	0.2
21	Chromium as Cr	mg/kg	20	13	34	30

**Package – 7 (230 and 110 kV Transmission Lines associated with Ottapidaram Substation)**

**a) Ambient Air Quality (24-hour Sampling)**

Sl.	Parameters	Units	Results		Permissible Limits as per NAAQS	WHO Air Quality Guidelines 2005 (in force at time of project approval)
			Lakshmi-puram	Vijayapuri		
1	Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	52.6	48.2	100	50
2	Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	24.1	20	60	25
3	Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	7.5	5.5	80	500 (10 min)
4	Oxides of Nitrogen (NO <sub>2</sub> )	µg/m <sup>3</sup>	18.6	12.6	80	200 (1-hr)

**b) Noise Quality (24-hour Sampling)**

Sl.	Parameters	Units	Leq		Permissible Limit as per NAAQS	WHO Guideline Value
			Lakshmi-puram	Vijayapuri		
1	Day Time	dB(A)	53.2	49.1	55	55
2	Nighttime	dB(A)	42.4	38.2	45	45

**c) Groundwater Quality**

Sl.	Parameters	Units	Results			
			Lakshmi-puram	Keezha subramania puram	Bommaipuram	Kamanaickanpatti
1	Colour	HU	2	2	2	2
2	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	-	8.1	8.3	8	8.2
4	Turbidity	NTU	6	10	24	28
5	Total Dissolved Solids (TDS)	mg/l	4342	4804	740	762
6	Total Suspended Solids (TSS)	mg/l	4	12	8	12
7	Electrical Conductivity	mg/l	7010	7748	1194	1230
8	Total Hardness as CaCO <sub>3</sub>	mg/l	1341	1419	254	276
9	Chlorides as Cl	mg/l	1796	1912	212	221
10	Total Alkalinity	mg/l	680	716	142	151
11	Calcium as Ca	mg/l	238	246	49	53
12	Magnesium as Mg	mg/l	182	106	32	35
13	Sulphate as SO <sub>4</sub>	mg/l	490	215	114	120
14	Nitrate as NO <sub>3</sub>	mg/l	7.6	9.6	7.2	6.7
15	Fluoride as F	mg/l	<0.1	<0.1	<0.1	<0.1
16	Biological Oxygen Demand (BOD)	mg/l	<2.0	<2.0	<2.0	<2.0
17	Chemical Oxygen Demand (COD)	mg/l	<4.0	<4.0	<4.0	<4.0
18	Dissolved Oxygen (DO)	mg/l	4.8	5.4	8.2	7.9
19	Iron as Fe	mg/l	0.03	0.05	0.02	0.05
20	Manganese as Mn	mg/l	<0.01	<0.01	<0.01	<0.01
21	Copper as Cu	mg/l	<0.02	<0.02	<0.02	<0.02
22	Total Coliform	MPN/100ml	11	23	9	27

## d) Soil Quality

Sl.	Parameters	Units	Results			
			Lakshmi-puram	Keezha subramania puram	Bommaipuram	Kamanaickan-patti
1	Texture:					
	Sand	%	72.24	76.12	56.17	42.13
	Silt	%	12.31	9.43	21.54	21.63
	Clay	%	15.45	14.45	22.29	36.24
2	pH	-	8.0	7.8	7.3	7.1
3	Cation Exchange Capacity	meq/100g	3.3	4.2	3.1	5.4
4	Sodium Absorption Ratio (SAR)	-	4.2	3.6	4.9	3.8
5	Electrical Conductivity	µs/cm	132	186	246	296
6	Bulk Density	g/cm <sup>3</sup>	1.46	1.53	1.43	1.47
7	Specific gravity	--	2.61	2.64	2.36	2.43
8	Moisture	mg/kg	15.9	12.8	9.47	11.32
9	Nitrogen as N	mg/kg	820	710	624	518
10	Phosphate as P	mg/kg	322	423	310	231
11	Potassium as K	mg/kg	456	612	418	319
12	Calcium as Ca	mg/kg	92	109	132	151
13	Magnesium as Mg	mg/kg	32	46	52	60
14	Alkalinity as CaCO <sub>3</sub>	mg/kg	112	134	108	138
15	Chlorides as Cl	mg/kg	118	145	116	162
16	Sodium as Na	mg/kg	241	274	312	219
17	Total organic carbon	%	0.53	0.65	1.1	1.3
18	Zinc as Zn	mg/kg	22.6	31.7	25.4	36.8
19	Manganese as Mn	mg/kg	78.6	101.5	84.5	116.3
20	Iron as Fe	%	0.72	0.91	0.74	0.61
21	Total Chromium as Cr	mg/kg	12.3	21.3	16.7	25.9

## APPENDIX 2: BIODIVERSITY IN THE PROJECT AREA

### a) Flora observed in the Right of Way along RoW

S. No	Common Name	Scientific Name	Family
1.	Gum Arabic Tree	<i>Acacia nilotica</i>	Mimosaceae
2.	Tree of heaven	<i>Ailanthus exelsa</i>	Simaroubaceae
3.	Neem tree	<i>Azadirachta indica</i>	Meliaceae
4.	Palmyra palm	<i>Borassus flabellifer</i>	Arecaceae
5.	Coconut tree	<i>Cocos nucifera</i>	Arecaceae
6.	White Gulmohar	<i>Delonix elata</i>	Caesalpineaceae
7.	Gulmohar	<i>Delonix regia</i>	Caesalpineaceae
8.	Indian mulberry	<i>Morinda tinctoria</i>	Rubiaceae
9.	Drumstick tree	<i>Moringa oleifera</i>	Moringaceae
10.	Banana	<i>Musa paradisiaca</i>	Musaceae
11.	Indian gooseberry	<i>Phyllanthus emblica</i>	Euphorbiaceae
12.	Madras thorn	<i>Pithecellobium dulce</i>	Fabaceae
13.	Algaroba	<i>Prosopis juliflora</i>	Mimosaceae
14.	Swamp pea	<i>Sesbania grandiflora</i>	Fabaceae
15.	Tamarind	<i>Tamarindas indica</i>	Fabaceae
16.	Teak tree	<i>Tectona grandis</i>	Lamiaceae
17.	Guava	<i>Psidium guajava</i>	Myrtaceae

### b) Horticulture and Agriculture crops

S.No	Common Name	Scientific Name	Family
1.	Banana plantation	<i>Musa paradisiaca</i>	Musaceae
2.	Papaya	<i>Carica papaya</i>	Caricaceae
3.	Cotton plantation	<i>Gossypium hirsuitam</i>	Malvaceae
4.	Sorgham	<i>Sorghum bicolor</i>	Poaceae
5.	Glory lilly	<i>Gloriosa superba</i>	Colchicaceae
6.	Common Jasmine	<i>Jasminum sambac</i>	Oleaceae
7.	Maize	<i>Zea mays</i>	Poaceae
8.	Bitter gourd	<i>Momordica charantia</i>	Cucurbitaceae
9.	Tomato	<i>Solanum lycopersicum</i>	Solanaceae
10.	Sorghum	<i>Sorghum bicolor</i>	Poaceae
11.	Black gram	<i>Vigna mungo</i>	Fabaceae
12.	Green gram	<i>Vigna radiata</i>	Fabaceae
13.	Brinjal	<i>Solanum melongena</i>	Solanaceae
14.	Chillies	<i>Capsicum annum</i>	Solanaceae
15.	Onion	<i>Allium ceiba</i>	Amaryllidaceae
16.	Paddy	<i>Oryza sativa</i>	Poaceae
17.	Red Gram	<i>Cajanus cajan</i>	Fabaceae

S.No	Common Name	Scientific Name	Family
18.	Ragi	<i>Eleusine coracana</i>	Poaceae
19.	Indian Chrysanthemum	<i>Chrysanthemum indicum</i>	Asteraceae
20.	Oleander	<i>Nerium oleander</i>	Apocynaceae
21.	Marigold	<i>Tagetes patula</i>	Asteraceae
22.	Cock's comb	<i>Celosia cristata</i>	Amaranthaceae

**c) Flora observed in the buffer area**

S.No	Common Name	Scientific Name	Family
1.	White barked Acacia	<i>Acacia leucophloea</i>	Mimosaceae
2.	Gum Arabic Tree	<i>Acacia nilotica</i>	Mimosaceae
3.	Tree of heaven	<i>Ailanthus exelsa</i>	Simaroubaceae
4.	Bitter albizia	<i>Albizia amara</i>	Mimosaceae
5.	Black siris	<i>Albizia labeckk</i>	Mimosaceae
6.	Neem tree	<i>Azadirachta indica</i>	Meliaceae
7.	Palmyra palm	<i>Borassus flabellifer</i>	Arecaceae
8.	Giant milk weed	<i>Calotropis procera</i>	Asclepiadaceae
9.	Tanner's cassia	<i>Cassia auriculata</i>	Fabaceae
10.	Silk cotton tree	<i>Ceiba pentandra</i>	Malvaceae
11.	Coconut	<i>Cocus nucifera</i>	Arecaceae
12.	Murray redgum	<i>Eucalyptus camaldulensis</i>	Myrtaceae
13.	Pencil Bush	<i>Euphorbia kodikalli</i>	Euphorbiaceae
14.	Coomb teak	<i>Gmelina arborea</i>	Lamiaceae
15.	Bastard cedar	<i>Guazuma tomentosa</i>	Malvaceae
16.	Tascam Jasmine	<i>Jasminum sambac</i>	Oleaceae
17.	Purging nut	<i>Jatropha curcas</i>	Asclepiadaceae
18.	Wild tamarind	<i>Leucaena leucocephala</i>	Fabaceae
19.	Mango	<i>Mangifera indica</i>	Anacardiaceae
20.	Indian mulberry	<i>Morinda tinctoria</i>	Rubiaceae
21.	Drum stick tree	<i>Moringa oleifera</i>	Moringaceae
22.	Banana	<i>Musa paradisiaca</i>	Musaceae
23.	Indian gooseberry	<i>Phyllanthus emblica</i>	Euphorbiaceae
24.	Madras thorn	<i>Pithecellobium dulce</i>	Fabaceae
25.	Algaroba	<i>Prosopis juliflora</i>	Mimosaceae
26.	Guava	<i>Psidium guajava</i>	Myrtaceae
27.	Castor bean	<i>Ricinus communis</i>	Euphorbiaceae
28.	Swamp pea	<i>Sesbania grandiflora</i>	Fabaceae
29.	Tamarind	<i>Tamarindas indica</i>	Fabaceae
30.	Teak tree	<i>Tectona grandis</i>	Lamiaceae

S.No	Common Name	Scientific Name	Family
31.	Indian Tulip tree	<i>Thespesia populnea</i>	Malvaceae
32.	Negundo	<i>Vitex negundo</i>	Lamiaceae
33.	Dyers, s oleander	<i>Wrightia tinctoria</i>	Asclepiadaceae
34.	Chinese lantern	<i>Dichrostachys cinerea</i>	Fabaceae
35.	Hopseed bush	<i>Dodanaea viscosae</i>	Sapindaceae
36.	Banyan Tree	<i>Ficus benghalensis</i>	Moraceae
37.	Sacred Fig	<i>Ficus religiosa</i>	Moraceae

**d) Flora observed in the Right of Way along RoW**



*Acacia leucophloea*



*Cassia auriculata*



*Justicia adhatoda*



*Morinda tinctoria*



*Nerium oleander*



*Tectona grandis*



*Albezia amara*



*Paddy field*



*Coconut grove*



*Tamarindus*



*Moringa oleifera*



*Jasminum sambac*



*Borassus flabellifer*



*Sorgham*



*Glory lilly*



*Chinese lantern*



*Dodanaea viscosae*



*Azadirachta indica*

## e) Density, Abundance and Frequency of Plant Species in Study Area

Species	Family	Core Zone			Inner Buffer Zone			Outer Buffer Zone		
		% FO	Density	Abundance	% FO	Density	Abundance	% FO	Density	Abundance
<i>Acacia horrida</i>	Mimosaceae	0.00	0.00	0.00	86.67	325.00	0.24	6.67	25.00	0.02
<i>Acacia leucophloea</i>	Mimosaceae	20.00	112.50	0.23	73.33	275.00	0.20	20.00	75.00	0.06
<i>Aegle marmelos</i>	Rutaceae	20.00	160.00	0.13	33.33	125.00	0.09	40.00	150.00	0.11
<i>Agave species</i>	Liliaceae	10.00	40.00	0.16	40.00	20.00	0.03	40.00	150.00	0.11
<i>Albizia amara</i>	Mimosaceae	20.00	92.50	0.19	86.67	325.00	0.24	66.67	250.00	0.19
<i>Albizia richardiana</i>	Mimosaceae	10.00	60.00	0.24	13.33	50.00	0.04	40.00	150.00	0.11
<i>Albizia lebbeck</i>	Mimosaceae	0.00	0.00	0.00	26.67	100.00	0.07	73.33	275.00	0.20
<i>Anogeissus latifolia</i>	Combretaceae	0.00	0.00	0.00	46.67	175.00	0.13	13.33	50.00	0.04
<i>Artocarpus heterophyllus</i>	Moraceae	0.00	0.00	0.00	20.00	75.00	0.06	13.33	50.00	0.04
<i>Azadirachta indica</i>	Meliaceae	80.00	332.50	0.17	80.00	300.00	0.22	20.00	75.00	0.06
<i>Bauhinia purpurea</i>	Caesalpineae	0.00	0.00	0.00	46.67	175.00	0.13	13.33	50.00	0.04
<i>Bauhinia racemosa</i>	Caesalpineae	0.00	0.00	0.00	40.00	150.00	0.11	33.33	125.00	0.09
<i>Bombax ceiba</i>	Bombacaceae	20.00	60.00	0.12	20.00	75.00	0.06	20.00	75.00	0.06
<i>Borassus flabellifer</i>	Aracaceae	60.00	124.00	0.32	40.00	250.00	0.26	13.33	50.00	0.04
<i>Butea monosperma</i>	Fabaceae	30.00	112.50	0.15	40.00	150.00	0.11	20.00	92.50	0.19
<i>Cactus species</i>	Cactaceae	40.00	185.00	0.19	100.00	426.00	0.38	6.67	25.00	0.02
<i>Calotropis gigantean</i>	Asclepiadaceae	30.00	45.00	0.06	20.00	24.00	0.06	6.67	25.00	0.02
<i>Capparis grandis</i>	Capparaceae	60.00	155.00	0.10	20.00	75.00	0.06	40.00	150.00	0.11
<i>Casuarina equisetifolia</i>	Casuarinaceae	20.00	35.00	0.07	6.67	25.00	0.02	6.67	25.00	0.02
<i>Cinnamomum malabatum</i>	Lauraceae	0.00	0.00	0.00	6.67	25.00	0.02	6.67	25.00	0.02
<i>Cissus quadrangularis</i>	Rutaceae	30.00	15.00	0.02	20.00	75.00	0.06	53.33	200.00	0.15

Species	Family	Core Zone			Inner Buffer Zone			Outer Buffer Zone		
		% FO	Density	Abundance	% FO	Density	Abundance	% FO	Density	Abundance
<i>Commiphora caudate</i>	Burseraceae	0.00	0.00	0.00	60.00	225.00	0.17	60.00	225.00	0.17
<i>Crateva magna</i>	Capparaceae	0.00	0.00	0.00	13.33	50.00	0.04	53.33	200.00	0.15
<i>Dalbergia sissoo</i>	Caesalpineae	40.00	187.50	0.08	6.67	25.00	0.02	6.67	25.00	0.02
<i>Delonix regia</i>	Caesalpineae	30.00	46.80	0.05	20.00	64.00	0.13	0.00	0.00	0.00
<i>Dolichandrone arcuata</i>	Bignoniaceae	0.00	0.00	0.00	13.33	50.00	0.04	33.33	125.00	0.09
<i>Dolichandrone atrovirens</i>	Bignoniaceae	0.00	0.00	0.00	6.67	25.00	0.02	13.33	50.00	0.04
<i>Erythrina suberosa</i>	Fabaceae	0.00	0.00	0.00	20.00	75.00	0.06	6.67	25.00	0.02
<i>Eucalyptus spp</i>	Myrtaceae	40.00	150.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00
<i>Euphorbia nivulia</i>	Euphorbiaceae	73.33	275.00	0.20	40.00	150.00	0.11	6.67	25.00	0.02
<i>Ficus benghalensis</i>	Moraceae	20.00	50.00	0.04	66.67	250.00	0.19	20.00	75.00	0.06
<i>Ficus hispida</i>	Moraceae	13.33	50.00	0.04	40.00	150.00	0.11	93.33	350.00	0.26
<i>Ficus religiosa</i>	Moraceae	20.00	75.00	0.06	73.33	275.00	0.20	13.33	50.00	0.04
<i>Flacourtia indica</i>	Flacourtiaceae	0.00	0.00	0.00	13.33	50.00	0.04	13.33	50.00	0.04
<i>Garuga pinnata</i>	Burseraceae	33.33	125.00	0.09	13.33	50.00	0.04	13.33	50.00	0.04
<i>Grewia tiliaefolia</i>	Tiliaceae	20.00	75.00	0.06	20.00	75.00	0.06	6.67	25.00	0.02
<i>Haldina cordifolia</i>	Rubiaceae	13.33	50.00	0.04	13.33	50.00	0.04	13.33	50.00	0.04
<i>Helicteres isora</i>	Sterculiaceae	0.00	0.00	0.00	30.00	123.00	0.17	6.67	25.00	0.02
<i>Holarrhena pubescens</i>	Apocynaceae	0.00	0.00	0.00	0.00	195.00	0.20	73.33	275.00	0.20
<i>Lagerstroemia parviflora</i>	Lythraceae	20.00	112.50	0.23	73.33	275.00	0.20	20.00	75.00	0.06
<i>Leucaena leucocephala</i>	Fabaceae	30.00	160.00	0.13	33.33	125.00	0.09	0.00	0.00	0.00
<i>Limonia acidissima</i>	Rutaceae	10.00	40.00	0.16	40.00	20.00	0.03	40.00	150.00	0.11
<i>Madhuca longifolia</i>	Sapotaceae	0.00	0.00	0.00	86.67	325.00	0.24	66.67	250.00	0.19

Species	Family	Core Zone			Inner Buffer Zone			Outer Buffer Zone		
		% FO	Density	Abundance	% FO	Density	Abundance	% FO	Density	Abundance
<i>Melia azedarachta</i>	Meliaceae	10.00	60.00	0.24	13.33	50.00	0.04	40.00	150.00	0.11
<i>Morinda pubescens</i>	Rubiaceae	0.00	0.00	0.00	30.00	15.00	0.02	6.67	25.00	0.02
<i>Moringa concanensis</i>	Moringaceae	0.00	0.00	0.00	0.00	0.00	0.00	53.33	200.00	0.15
<i>Murraya koenigii</i>	Rutaceae	0.00	0.00	0.00	0.00	57.50	0.06	60.00	225.00	0.17
<i>Phyllanthus emblica</i>	Euphorbiaceae	0.00	0.00	0.00	40.00	187.50	0.08	53.33	200.00	0.15
<i>Plumeria rubra</i>	Apocynaceae	0.00	0.00	0.00	30.00	46.80	0.05	6.67	25.00	0.02
<i>Prosopis Juliflora</i>	Mimosaceae	70.00	35.00	0.21	100.00	1257.00	3.67	100.00	6250.00	4.61
<i>Psidium guajava</i>	Myrtaceae	40.00	28.00	0.18	20.00	24.00	0.02	33.33	125.00	0.09
<i>Spathodea campanulata</i>	Bignoniaceae	0.00	0.00	0.00	0.00	0.00	0.00	6.67	25.00	0.02
<i>Sterculia urens</i>	Sterculiaceae	0.00	0.00	0.00	0.00	0.00	0.00	26.67	100.00	0.07
<i>Stereospermum colais</i>	Bignoniaceae	0.00	0.00	0.00	0.00	0.00	0.00	6.67	25.00	0.02
<i>Syzygium cumini</i>	Myrtaceae	40.00	150.00	0.11	13.33	50.00	0.04	26.67	100.00	0.07
<i>Tamarindus indica</i>	Caesalpineae	73.33	275.00	0.20	50.00	69.00	1.46	6.67	25.00	0.02
<i>Tectona grandis</i>	Verbenaceae	13.33	50.00	0.04	20.00	112.50	0.23	20.00	75.00	0.06
<i>Terminalia catapa</i>	Combretaceae	13.33	50.00	0.04	30.00	160.00	0.13	93.33	350.00	0.26
<i>Terminalia crenulata</i>	Combretaceae	0.00	0.00	0.00	46.67	175.00	0.13	13.33	50.00	0.04
<i>Terminalia paniculata</i>	Combretaceae	0.00	0.00	0.00	20.00	75.00	0.06	13.33	50.00	0.04
<i>Vitex negundo</i>	Verbenaceae	80.00	332.50	0.17	80.00	300.00	0.22	20.00	75.00	0.06
<i>Wrightia tinctoria</i>	Apocynaceae	0.00	0.00	0.00	46.67	175.00	0.13	13.33	50.00	0.04
<i>Zyziphus jujuba</i>	Rhamnaceae	0.00	0.00	0.00	40.00	150.00	0.11	33.33	125.00	0.09
<i>Zyziphus xylopyrus</i>	Rhamnaceae	20.00	60.00	0.12	20.00	75.00	0.06	20.00	75.00	0.06

## f) Avifauna (Birds) Observed in the Study Area

Sr. No.	Common Name	Scientific Name	Habit	IUCN Status
1	Great Egret	<i>Casmerodius albus</i>	R	Least Concerned
2	Intermediate Egret	<i>Mesophoyx intermedia</i>	R	Least Concerned
3	Little Egret	<i>Egretta garzetta</i>	R	Least Concerned
4	Cattle Egret	<i>Bubulcus ibis</i>	R	Least Concerned
5	Painted Stork	<i>Mycteria leucocephala</i>	R	Least Concerned
6	Indian Pond Heron	<i>Ardeola grayii</i>	R	Least Concerned
7	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	R	Least Concerned
8	Oriental White Ibis	<i>Threskiornis melanocephalus</i>	R	Least Concerned
9	Red Naped Ibis	<i>Pseudibis papillosa</i>	R	Least Concerned
10	Glossy Ibis	<i>Plegadis falcinellus</i>	R	Least Concerned
11	Little Grebe	<i>Tachybaptus ruficollis</i>	R	Least Concerned
12	Spot Billed Duck	<i>Anas poecilorhyncha</i>	R	Least Concerned
13	Black Kite	<i>Milvus migrans</i>	R	Least Concerned
14	Black Shouldered Kite	<i>Elanus axillaris</i>	R	Least Concerned
15	Common Kestrel	<i>Falco tinnunculus</i>	M	Least Concerned
16	Crested Serpent Eagle	<i>Spilornis cheela</i>	R	WLPA Schedule I
17	Indian Peafowl	<i>Pavo cristatus</i>	R	WLPA Schedule I
18	Laggar Falcon	<i>Falco jugger</i>	R	Least Concerned
19	Indian Eagle-Owl	<i>Bubo benghalensis</i>	R	Least Concerned
20	Jungle Bush Quail	<i>Perdica asiatica</i>	R	Least Concerned
21	Indian Rosering Parakit	<i>Psittakula krameri</i>	R	Least Concerned
22	Greater Coucal	<i>Centropus sinensis</i>	R	Least Concerned
23	Spotted Owlet	<i>Athene brama</i>	R	Least Concerned
24	Asian Koel	<i>Chrysococcyx maculatus</i>	R	Least Concerned
25	Indian Roller	<i>Coracias benghalensis</i>	R	Least Concerned
26	Sand Lark	<i>Calandrella raytal</i>	R	Least Concerned
27	Crested Lark	<i>calandrella crestata</i>	R	Least Concerned
28	Barn Swallow	<i>Hirundo rustica</i>	M	Least Concerned
29	House swift	<i>Apun affinis</i>	R	Least Concerned
30	Asian Palm Swift	<i>Cypsiurus balasinensis</i>	R	Least Concerned
31	Common Hoopoe	<i>Upupa epops</i>	R	Least Concerned
32	Large Billed crow	<i>Corvus macrorbynchos</i>	R	Least Concerned
33	House Crow	<i>Corvus splendens</i>	R	Least Concerned
34	Red Vented Bulbul	<i>Pycnonotus cafer</i>	R	Least Concerned
35	Red Whiskered Bulbul	<i>Pycnonotus jocosus</i>	R	Least Concerned
36	Black Drongo	<i>Dicirrus macrocercus</i>	R	Not Assessed

Sr. No.	Common Name	Scientific Name	Habit	IUCN Status
37	Long Tailed Shrike	<i>Laniaus schach</i>	R	Least Concerned
38	Bank Myna	<i>Acridotheres ginginianus</i>	R	Least Concerned
39	Common Myna	<i>Acridotheres tristis</i>	R	Least Concerned
40	Wire Tailed Swallow	<i>Hirundo smithii</i>	R	Least Concerned
41	Eurasian Collared Dove	<i>Streptopelia decaocto</i>	R	Least Concerned
42	Spotted Dove	<i>Streptopelia chinensis</i>	R	Not Assessed
43	Rock Pigeon	<i>Columba livia</i>	R	Least Concerned
44	Large Grey Babbler	<i>Terdoides malcolmi</i>	R	Least Concerned
45	Jungle Babbler	<i>Terdoides striatus</i>	R	Not Assessed
46	Booted Wabler	<i>Hippolais caligata</i>	M	Not Assessed
47	Sykes's Wabler	<i>Hippolais rama</i>	M	Least Concerned
48	Oriental Magpie Robin	<i>Copsychus saularis</i>	R	Least Concerned
49	House Sparrow	<i>Passer domesticus</i>	R	Not Assessed
50	Red Wattled Lapwing	<i>Vanellus indicus</i>	R	Least Concerned
51	Little Ringed Plover	<i>Charadrius dubius</i>	R	Least Concerned
52	Blue Cheeked Bee-eater	<i>Merops persicus</i>	M	Not Assessed
53	Green Bee-eater	<i>Meropus orientalis</i>	R	Not Assessed

**g) Presence of Avifauna in Study Area**



*Black Shoulder Kite*



*Indian Peafowl Male – Schedule I species*



*Greater Coucal*



*Jungle Bush Quail*



*Red Naped Ibis*



*Painted Storks*



*Eurasian Collared Dove*



*Oriental White Ibis*



*Indian Roller*



*Spotted Dove*



*Pond Heron*



*Blue Cheeked Bee Eater*



*Cattle Egret*



*Blue Faced Malkoha*



*Rose Ring Parakeets*



*Black Drongo*



*White Throated Kingfisher*



*Indian Shikra*



*Wire Tailed Swallows*



*Black Tailed Wagtail*



*Indian Cormorant*



*Glossy Ibis*



*Purple Sunbird*



*Red Wattled Lapwing*

## h) Other Fauna (Reptiles, Mammals) within Project Area

S. No	Common Name	Scientific Name	WPA (1972)	IUCN Status
<b>Reptiles</b>				
1	Indian Garden lizard	<i>Calotes versicolor</i>	Sch IV	LC
2	Spectacled cobra	<i>Naja naja</i>	Sch II	LC
3	Saw scaled viper	<i>Echis carinatus</i>	Sch IV	LC
4	Common krait	<i>Bungarus caeruleus</i>	Sch IV	LC
5	Common sand boa	<i>Eryx jhonii</i>	Sch IV	LC
<b>Mammals</b>				
6	Indian wild hare	<i>Lepus nigricollis</i>	Sch IV	LC
7	Palm squirrel	<i>Punumbulus palmarum</i>	Sch IV	LC
8	Rice field rat	<i>Bandicota bengalensis</i>	Sch IV	LC
9	Flying fox	<i>Pteropus giganteus</i>	Sch IV	LC



Garden lizard



Palm squirrel

## APPENDIX 3: IBAT REPORT FOR 400 KV PACKAGE 3



### Integrated Biodiversity Assessment Tool PROXIMITY REPORT PACKAGE 3 - 400 KV TRANSMISSION LINE

Country: India  
 Location: [9.1, 77.9]  
 Date of analysis: 17 November 2021 (GMT)  
 Buffers applied: 10 km | 25 km | 50 km  
 IUCN Red List Biomes: Marine, Freshwater, Terrestrial  
 Generated by: Pushpanathan K.  
 Organisation: ADB

**Overlaps with:**

Protected Areas	2
Key Biodiversity Areas	7
IUCN Red List	224



Displaying project location and buffers: 10 km, 25 km, 50 km



### Protected Areas

The following protected areas are found within 10 km, 25 km, 50 km of the area of interest. For further details please refer to the associated csv file in the report folder.

Area name	Within buffer of
Gulf of Mannar	50 km
Western Ghats	50 km

### Key Biodiversity Areas

The following key biodiversity areas are found within 10 km, 25 km, 50 km of the area of interest. For further details please refer to the associated csv file in the report folder.

Area name	Distance
Kullur Sandai Reservoir	25 km
Chitragudi and Kanjirankulam Bird Sanctuary	50 km
Kalakad-Mundanthurai Tiger Reserve	50 km
Kunthangulam Bird Sanctuary	50 km
Melagiris	50 km
Srivilliputhur Wildlife Sanctuary	50 km
Watrap Periakulam and Virakasamuthrakulam	50 km

### IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Carcharias taurus</i>	Sand Tiger Shark	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine
<i>Garcinia travancorica</i>	Travancore Gamboge	MAGNOLIOPSIDA	CR	Unknown	Terrestrial
<i>Carcharhinus hemiodon</i>	Pondicherry Shark	CHONDRICHTHYES	CR	Unknown	Marine
<i>Carcharhinus longimanus</i>	Oceanic Whitetip Shark	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Sphyrna lewini</i>	Scalloped Hammerhead	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Sphyrna mokarran</i>	Great Hammerhead	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Pristis zijsron</i>	Green Sawfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Rhina ancylostoma</i>	Bowmouth Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Rhynchobatus australiae</i>	Bottlenose Wedgefish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Rhynchobatus laevis</i>	Smoothnose Wedgefish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Glaucostegus granulatus</i>	Sharpnose Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Glaucostegus obtusus</i>	Widenose Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Glaucostegus thouin</i>	Clubnose Guitarfish	CHONDRICHTHYES	CR	Unknown	Marine
<i>Acroteriobatus variegatus</i>	Stripenose Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Rhinobatos annandalei</i>	Bengal Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Gymnura tentaculata</i>	Tentacled Butterfly Ray	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Rhinobatos lionotus</i>	Smoothback Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Pristis pristis</i>	Large-tooth Sawfish	CHONDRICHTHYES	CR	Decreasing	Marine, Freshwater
<i>Gyps bengalensis</i>	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
<i>Sarcogyps calvus</i>	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Gyps indicus</i>	Indian Vulture	AVES	CR	Decreasing	Terrestrial
<i>Glaucostegus typus</i>	Giant Guitarfish	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Maculabatis bineeshi</i>	Shorttail Whipray	CHONDRICHTHYES	CR	Decreasing	Marine
<i>Pelochelys cantorii</i>	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
<i>Balaenoptera musculus</i>	Blue Whale	MAMMALIA	EN	Increasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Carcharhinus plumbeus</i>	Sandbar Shark	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Cuon alpinus</i>	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
<i>Elephas maximus</i>	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
<i>Nilgiritragus hylocrius</i>	Nilgiri Tahr	MAMMALIA	EN	Decreasing	Terrestrial
<i>Lalidens salimalii</i>	Salim Ali's Fruit Bat	MAMMALIA	EN	Decreasing	Terrestrial
<i>Macaca silenus</i>	Lion-tailed Macaque	MAMMALIA	EN	Decreasing	Terrestrial
<i>Manis crassicaudata</i>	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial
<i>Panthera tigris</i>	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
<i>Rhincodon typus</i>	Whale Shark	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Cinnamomum filipedicellatum</i>		MAGNOLIOPSIDA	EN	Unknown	Terrestrial
<i>Isurus oxyrinchus</i>	Shortfin Mako	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Carcharhinus amblyrhynchos</i>	Grey Reef Shark	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Anoxypristis cuspidata</i>	Narrow Sawfish	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Eusphyrus blochii</i>	Winghead Shark	CHONDRICHTHYES	EN	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Mobula eregoodoo</i>	Longhorned Pygmy Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Negaprion acutidens</i>	Sharptooth Lemon Shark	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Stegostoma tigrinum</i>	Zebra Shark	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Indirana diplosticta</i>	Spotted Leaping Frog	AMPHIBIA	EN	Decreasing	Terrestrial, Freshwater
<i>Indirana leptodactyla</i>	Boulenger's Indian Frog	AMPHIBIA	EN	Decreasing	Terrestrial, Freshwater
<i>Nyctibatrachus vasanthi</i>	Kalakad Wrinkled Frog	AMPHIBIA	EN	Decreasing	Terrestrial
<i>Gymnura zonura</i>	Zonetail Butterfly Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Aetomylaeus maculatus</i>	Mottled Eagle Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Aetomylaeus vesperillo</i>	Omate Eagle Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Rhinoptera javanica</i>	Javanese Cownose Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Mobula tarapacana</i>	Sicklefin Devilray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Mobula thurstoni</i>	Bentfin Devilray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Isurus paucus</i>	Longfin Mako	CHONDRICHTHYES	EN	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Acropora rudis</i>		ANTHOZOA	EN	Decreasing	Marine
<i>Mobula kuhlii</i>	Shortfin Devilray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Narcine prodorsalis</i>	Tonkin Numbfish	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Maculabatis gerrardi</i>	Whitespotted Whipray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Alopias pelagicus</i>	Pelagic Thresher	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Horallabiosa joshuai</i>	Lipped Algae Eater	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Nemacheilus pulchellus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Garra kalakadensis</i>	Kalakad Stone Carp	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Glyptothorax madraspatanus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Hypselobarbus dubius</i>	Nilgiri Barb	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Hypselobarbus mussullah</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Tor malabaricus</i>	Malabar Mahseer	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Pterocryptis wynaadensis</i>	Malabar Silurus	ACTINOPTERYGII	EN	Decreasing	Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Dasia subcaerulea</i>	Boulenger's Dasia	REPTILIA	EN	Unknown	Terrestrial
<i>Hydrocotyle conferta</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Fimbristylis crystallina</i>		LILIOPSIDA	EN	Unknown	Terrestrial, Freshwater
<i>Fimbristylis dauciformis</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Dimeria hohenackeri</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Lindernia minima</i>		MAGNOLIOPSIDA	EN	Decreasing	Freshwater
<i>Holothuria scabra</i>	Golden Sandfish	HOLOTHUROIDEA	EN	Decreasing	Marine
<i>Holothuria lessona</i>	Golden Sandfish	HOLOTHUROIDEA	EN	Decreasing	Marine
<i>Holothuria nobilis</i>	Black Teatfish	HOLOTHUROIDEA	EN		Marine
<i>Thelenota ananas</i>	Prickly Redfish	HOLOTHUROIDEA	EN	Decreasing	Marine
<i>Cyathea crinita</i>		POLYPODIOPSIDA	EN	Decreasing	Freshwater
<i>Rhinoptera jayakari</i>	Oman Cownose Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Mobula birostris</i>	Giant Manta Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Lethrinus mahsena</i>	Sky Emperor	ACTINOPTERYGII	EN	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Sypheotides indicus</i>	Lesser Florican	AVES	EN	Decreasing	Terrestrial
<i>Sterna acuticauda</i>	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Neophron percnopterus</i>	Egyptian Vulture	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Aquila nipalensis</i>	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
<i>Argyrosomus japonicus</i>	Dusky Meagre	ACTINOPTERYGII	EN	Decreasing	Marine
<i>Dysoxylum malabaricum</i>	White Cedar	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Humboldtia vahliana</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Carcharhinus dussumieri</i>	Whitecheek Shark	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Telatrygon crozieri</i>	Indian Sharpnose Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Pateobatis bleekeri</i>	Bleeker's Whipray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Mobula mobular</i>	Spinetail Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Aetobatus flagellum</i>	Longhead Eagle Ray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Lamiopsis temminckii</i>	Broadfin Shark	CHONDRICHTHYES	EN	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Hipposideros pomona</i>	Andersen's Roundleaf Bat	MAMMALIA	EN	Decreasing	Terrestrial
<i>Himantura uarnak</i>	Coach Whipray	CHONDRICHTHYES	EN	Decreasing	Marine
<i>Bos gaurus</i>	Gaur	MAMMALIA	VU	Decreasing	Terrestrial
<i>Carcharhinus limbatus</i>	Blacktip Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Carcharodon carcharias</i>	White Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Caretta caretta</i>	Loggerhead Turtle	REPTILIA	VU	Decreasing	Terrestrial, Marine
<i>Crocodylus palustris</i>	Mugger	REPTILIA	VU	Stable	Terrestrial, Freshwater
<i>Demochelys coriacea</i>	Leatherback	REPTILIA	VU	Decreasing	Terrestrial, Marine
<i>Dugong dugon</i>	Dugong	MAMMALIA	VU	Decreasing	Marine
<i>Hippocampus histrix</i>	Thorny Seahorse	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Hippocampus trimaculatus</i>	Three-spot Seahorse	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Lepidochelys olivacea</i>	Olive Ridley	REPTILIA	VU	Decreasing	Terrestrial, Marine
<i>Lutrogale perspicillata</i>	Smooth-coated Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Macaca radiata</i>	Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Martes gwatkinsii</i>	Nilgiri Marten	MAMMALIA	VU	Stable	Terrestrial
<i>Melursus ursinus</i>	Sloth Bear	MAMMALIA	VU	Decreasing	Terrestrial
<i>Panthera pardus</i>	Leopard	MAMMALIA	VU	Decreasing	Terrestrial
<i>Alopias vulpinus</i>	Common Thresher	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Carcharhinus amboinensis</i>	Pigeeye Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Carcharhinus brevipinna</i>	Spinner Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Carcharhinus falciformis</i>	Silky Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Carcharhinus leucas</i>	Bull Shark	CHONDRICHTHYES	VU	Decreasing	Marine, Freshwater
<i>Carcharhinus melanopterus</i>	Blacktip Reef Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Triaenodon obesus</i>	Whitetip Reef Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Sphyrna zygaena</i>	Smooth Hammerhead	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Urogymnus asperrimus</i>	Porcupine Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Geochelone elegans</i>	Indian Star Tortoise	REPTILIA	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Macaca radiata</i> <i>ssp. diluta</i>	Pale-bellied Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Carcharhinus</i> <i>amblyrhynchoides</i>	Graceful Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Hippocampus</i> <i>kelloggi</i>	Great Seahorse	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Physeter</i> <i>macrocephalus</i>	Sperm Whale	MAMMALIA	VU	Unknown	Marine
<i>Rusa unicolor</i>	Sambar	MAMMALIA	VU	Decreasing	Terrestrial
<i>Chiloscyllium</i> <i>indicum</i>	Slender Bambooshark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Chiloscyllium</i> <i>griseum</i>	Grey Bamboo Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Hemigaleus</i> <i>microstoma</i>	Sicklefin Weasel Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Nebrius</i> <i>ferrugineus</i>	Tawny Nurse Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Rhizoprionodon</i> <i>acutus</i>	Milk Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Hemipristis</i> <i>elongata</i>	Snaggletooth Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Epinephelus</i> <i>fuscoguttatus</i>	Brown- marbled Groupers	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Semnopithecus</i> <i>johnii</i>	Nilgiri Langur	MAMMALIA	VU	Stable	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Micrixalus saxicola</i>	Malabar Tropical Frog	AMPHIBIA	VU	Stable	Terrestrial, Freshwater
<i>Nyctibatrachus deccanensis</i>		AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Indosylvirana aurantiaca</i>	Boulenger's Golden-backed frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Gymnura poecilura</i>	Longtail Butterfly Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Taeniurops meyeri</i>	Blotched Fantail Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Plectropomus areolatus</i>	Squairetail Coraigrouper	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Montipora angulata</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Pavona venosa</i>		ANTHOZOA	VU	Unknown	Marine
<i>Catalaphyllia jardinei</i>		ANTHOZOA	VU	Unknown	Marine
<i>Pectinia lactuca</i>	Lettuce Coral	ANTHOZOA	VU	Unknown	Marine
<i>Pectinia alvicornis</i>		ANTHOZOA	VU	Unknown	Marine
<i>Montipora stitosa</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Acropora hemprichii</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Porites nigrescens</i>		ANTHOZOA	VU	Unknown	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Pavona decussata</i>	Cactus Coral	ANTHOZOA	VU	Unknown	Marine
<i>Pocillopora danae</i>		ANTHOZOA	VU	Unknown	Marine
<i>Symphyllia hassi</i>		ANTHOZOA	VU	Unknown	Marine
<i>Euphyllia ancora</i>		ANTHOZOA	VU	Unknown	Marine
<i>Heliopora coerulea</i>	Blue Coral	ANTHOZOA	VU	Decreasing	Marine
<i>Acropora pharaonis</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Montastrea serageldini</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Caulastrea connata</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Alveopora allingi</i>		ANTHOZOA	VU	Unknown	Marine
<i>Galaxea astreata</i>		ANTHOZOA	VU	Unknown	Marine
<i>Goniopora albiconus</i>		ANTHOZOA	VU	Unknown	Marine
<i>Turbinaria stellulata</i>		ANTHOZOA	VU	Unknown	Marine
<i>Pachyseris rugosa</i>		ANTHOZOA	VU	Unknown	Marine
<i>Physogyra lichtensteini</i>		ANTHOZOA	VU	Unknown	Marine
<i>Acropora aculeus</i>		ANTHOZOA	VU	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Isopora crateriformis</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Turbinaria peltata</i>		ANTHOZOA	VU	Unknown	Marine
<i>Acropora palmerae</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Acanthastrea brevis</i>		ANTHOZOA	VU	Unknown	Marine
<i>Pavona cactus</i>		ANTHOZOA	VU	Unknown	Marine
<i>Turbinaria mesenterina</i>		ANTHOZOA	VU	Unknown	Marine
<i>Isopora cuneata</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Acropora echinata</i>		ANTHOZOA	VU	Decreasing	Marine
<i>Urogymnus granulatus</i>	Mangrove Whipray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Narcine timiei</i>	Brown Numbfish	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Paragaleus randalli</i>	Slender Weasel Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Narcine atzi</i>	Oman Numbfish	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Chaenogaleus macrostoma</i>	Hooktooth Shark	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Alopias superciliosus</i>	Bigeye Thresher	CHONDRICHTHYES	VU	Decreasing	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Brevitrygon imbricata</i>	Bengal Whipray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Pateobatis jenkinsii</i>	Jenkins' Whipray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Wallago attu</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Bagarius yarrelli</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Cirrhinus cirrhosus</i>	Mrigal Carp	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Puntius arenatus</i>	Arenatus Barb	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Hypselobarbus kolus</i>	Kolus Barb	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Oligodon brevicauda</i>	Short-tailed Kukri Snake	REPTILIA	VU	Unknown	Terrestrial
<i>Cnemaspis jerdonii</i>	Jerdon's Day Gecko	REPTILIA	VU	Unknown	Terrestrial
<i>Halophila beccarii</i>	Ocean Turf Grass	LILIOPSISIDA	VU	Decreasing	Marine
<i>Diospyros candolleana</i>		MAGNOLIOPSISIDA	VU	Decreasing	Terrestrial
<i>Chlorogomphus xanthoptera</i>		INSECTA	VU	Unknown	Terrestrial, Freshwater
<i>Anaphalis beddomei</i>		MAGNOLIOPSISIDA	VU	Decreasing	Terrestrial, Freshwater
<i>Anaphalis leptophylla</i>		MAGNOLIOPSISIDA	VU	Unknown	Terrestrial, Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Anaphalis wightiana</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Notonia shevaroyensis</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Ophiophagus hannah</i>	King Cobra	REPTILIA	VU	Decreasing	Terrestrial
<i>Stichopus hermanni</i>	Curryfish	HOLOTHUROIDEA	VU	Decreasing	Marine
<i>Actinopyga miliaris</i>	Harry Blackfish	HOLOTHUROIDEA	VU	Decreasing	Marine
<i>Actinopyga mauritiana</i>	Surf Redfish	HOLOTHUROIDEA	VU	Decreasing	Marine
<i>Pomatomus saltatrix</i>	Bluefish	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Kaestlea laterimaculata</i>		REPTILIA	VU	Unknown	Terrestrial
<i>Mobula alfredi</i>	Reef Manta Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Neophocaena phocaenoides</i>	Indo-Pacific Finless Porpoise	MAMMALIA	VU	Decreasing	Marine
<i>Holothuria fuscogilva</i>		HOLOTHUROIDEA	VU	Decreasing	Marine
<i>Acentrogobius griseus</i>	Grey Goby	ACTINOPTERYGII	VU	Unknown	Marine
<i>Cynoglossus macrostomus</i>	Malabar Tonguesole	ACTINOPTERYGII	VU	Unknown	Marine



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Anacyclus pyrethrum</i>	Atlas Daisy	MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Magnolia nilagirica</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Ocyrceros griseus</i>	Malabar Grey Hornbill	AVES	VU	Decreasing	Terrestrial
<i>Buceros bicornis</i>	Great Hornbill	AVES	VU	Decreasing	Terrestrial
<i>Columba elphinstonii</i>	Nilgiri Woodpigeon	AVES	VU	Decreasing	Terrestrial
<i>Gallinago nemoricola</i>	Wood Snipe	AVES	VU	Decreasing	Terrestrial, Freshwater
<i>Sterna aurantia</i>	River Tern	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Pycnonotus xantholaemus</i>	Yellow-throated Bulbul	AVES	VU	Decreasing	Terrestrial
<i>Clanga hastata</i>	Indian Spotted Eagle	AVES	VU	Decreasing	Terrestrial
<i>Aetobatus ocellatus</i>	Spotted Eagle Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Omobranchus smithi</i>		ACTINOPTERYGII	VU	Unknown	Marine
<i>Calophyllum apetalum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Cinnamomum sulphuratum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Hydnocarpus pentandrus</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Pastinachus ater</i>	Broad Cowtail Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Aetomylaeus nichofii</i>	Banded Eagle Ray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Funambulus sublineatus</i>	Dusky-striped Squirrel	MAMMALIA	VU	Decreasing	Terrestrial
<i>Bathytoshia lata</i>	Brown Stingray	CHONDRICHTHYES	VU	Decreasing	Marine
<i>Hippocampus spinosissimus</i>	Hedgehog Seahorse	ACTINOPTERYGII	VU	Decreasing	Marine
<i>Oryza malampuzhaensis</i>		LILIOPSIDA	VU	Decreasing	Terrestrial
<i>Lissemys punctata</i>	Indian Flapshell Turtle	REPTILIA	VU	Decreasing	Terrestrial, Freshwater

## APPENDIX 4: IBAT REPORT FOR 765 KV PACKAGE 4



### Integrated Biodiversity Assessment Tool PROXIMITY REPORT REACH I - 765KV

Country: India

Location: [ 9.8, 77.9 ]

Date of analysis: 09 November 2021 (GMT)

Buffers applied: 10 km | 25 km | 50 km

IUCN Red List Biomes: Freshwater, Terrestrial

Generated by: Pushpanathan K

Organisation: ADB

#### Overlaps with:

Protected Areas	2
Key Biodiversity Areas	10
IUCN Red List	101



Displaying project location and buffers: 10 km, 25 km, 50 km





### Protected Areas

The following protected areas are found within 10 km, 25 km, 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Within buffer of
Western Ghats	25 km
Gulf of Mannar	50 km

### Key Biodiversity Areas

The following key biodiversity areas are found within 10 km, 25 km, 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Distance
Kullur Sandai Reservoir	10 km
Palni Hills (including Kodaikanal Reserve Forest)	25 km
Srivilliputhur Wildlife Sanctuary	25 km
Berijam (Kodaikanal)	50 km
Chitragudi and Kanjirankulam Bird Sanctuary	50 km
Poomparai and Kukkal	50 km
Shola around Kodaikanal	50 km
Theni Forest Divisions	50 km
Vandivoorand Kunnathur Tanks (Madurai)	50 km
Watrap Periakulam and Virakasamuthrakulam	50 km



## IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Nilssonia leithii</i>	Leith's Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Hypselobarbus thomassi</i>	Red Canarese Barb	ACTINOPTERYGII	CR	Unknown	Freshwater
<i>Tor remadevii</i>	Hump-backed Mahseer	ACTINOPTERYGII	CR	Decreasing	Freshwater
<i>Pelochelys cantorii</i>	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
<i>Ardeotis nigriceps</i>	Great Indian Bustard	AVES	CR	Decreasing	Terrestrial
<i>Gyps bengalensis</i>	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
<i>Sarcogyps calvus</i>	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Indirana diplosticta</i>	Spotted Leaping Frog	AMPHIBIA	EN	Decreasing	Terrestrial, Freshwater
<i>Horallabiosa joshuai</i>	Lipped Algae Eater	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Nemacheilus pulchellus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Glyptothorax madraspatanus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Puntius cauveriensis</i>	Cauvery Barb	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Hypselobarbus dubius</i>	Nilgiri Barb	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Hypselobarbus mussullah</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Tor malabaricus</i>	Malabar Mahseer	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Pterocryptis wynaadensis</i>	Malabar Silurus	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Hydrocotyle conferta</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Fimbristylis crystallina</i>		LILIOPSIDA	EN	Unknown	Terrestrial, Freshwater
<i>Fimbristylis dauciformis</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Dimeria hohenackeri</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Lindemia minima</i>		MAGNOLIOPSIDA	EN	Decreasing	Freshwater
<i>Cyathea crinita</i>		POLYPODIOPSIDA	EN	Decreasing	Freshwater
<i>Sterna acuticauda</i>	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Cuon alpinus</i>	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
<i>Elephas maximus</i>	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Feroculus feroculus</i>	Kelaart's Long-clawed Shrew	MAMMALIA	EN	Decreasing	Terrestrial
<i>Nilgiritragus hylocrius</i>	Nilgiri Tahr	MAMMALIA	EN	Decreasing	Terrestrial
<i>Latidens saimali</i>	Salim Ali's Fruit Bat	MAMMALIA	EN	Decreasing	Terrestrial
<i>Manis crassicaudata</i>	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial
<i>Panthera tigris</i>	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
<i>Raorchestes travancoricus</i>	Travancore Bush Frog	AMPHIBIA	EN	Unknown	Terrestrial
<i>Haploclostus kayi</i>	Parambikulam Large Burrowing Spider	ARACHNIDA	EN	Decreasing	Terrestrial
<i>Dasia subcaerulea</i>	Boulenger's Dasia	REPTILIA	EN	Unknown	Terrestrial
<i>Platyplectrurus madurensis</i>	Travancore Hills Thorntail Snake	REPTILIA	EN	Unknown	Terrestrial
<i>Sypheotides indicus</i>	Lesser Florican	AVES	EN	Decreasing	Terrestrial
<i>Aquila nipalensis</i>	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
<i>Cinnamomum wightii</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Dysoxylum malabaricum</i>	White Cedar	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Humboldtia vahliana</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Cinnamomum gamblei</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Cinnamomum keralaense</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Crocodylus palustris</i>	Mugger	REPTILIA	VU	Stable	Terrestrial, Freshwater
<i>Lutrogale perspicillata</i>	Smooth-coated Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Aonyx cinereus</i>	Asian Small-clawed Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Micrixalus phyllophilus</i>	Nilgiri Dancing Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Nyctibatrachus major</i>	Malabar Night Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Wallago attu</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Bagarius yarrelli</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Cirrhinus cirrhosus</i>	Mrigal Carp	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Garra menoni</i>	Silent Valley Stone Sucker	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Puntius arenatus</i>	Arenatus Barb	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Mesonoemacheilus pambarensis</i>	Pambar Banded Loach	ACTINOPTERYGII	VU	Unknown	Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Hypselobarbus kolus</i>	Kolus Barb	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Horababiosa palaniensis</i>		ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Chlorogomphus xanthoptera</i>		INSECTA	VU	Unknown	Terrestrial, Freshwater
<i>Anaphalis beddomei</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial, Freshwater
<i>Anaphalis leptophylla</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Anaphalis wightiana</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Notonia shevaroyensis</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Gallinago nemoricola</i>	Wood Snipe	AVES	VU	Decreasing	Terrestrial, Freshwater
<i>Sterna aurantia</i>	River Tern	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Leptoptilos javanicus</i>	Lesser Adjutant	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Chaetomis striata</i>	Bristled Grassbird	AVES	VU	Decreasing	Terrestrial, Freshwater
<i>Lissemys punctata</i>	Indian Flapshell Turtle	REPTILIA	VU	Decreasing	Terrestrial, Freshwater
<i>Bos gaurus</i>	Gaur	MAMMALIA	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Macaca radiata</i>	Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Martes gwatkinsii</i>	Nilgiri Marten	MAMMALIA	VU	Stable	Terrestrial
<i>Melursus ursinus</i>	Sloth Bear	MAMMALIA	VU	Decreasing	Terrestrial
<i>Panthera pardus</i>	Leopard	MAMMALIA	VU	Decreasing	Terrestrial
<i>Suncus montanus</i>	Sri Lanka Highland Shrew	MAMMALIA	VU	Decreasing	Terrestrial
<i>Shorea roxburghii</i>	White Meranti	MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Litsea nigrescens</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial
<i>Geochelone elegans</i>	Indian Star Tortoise	REPTILIA	VU	Decreasing	Terrestrial
<i>Macaca radiata ssp. radiata</i>	Dark-bellied Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Macaca radiata ssp. diluta</i>	Pale-bellied Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Rusa unicolor</i>	Sambar	MAMMALIA	VU	Decreasing	Terrestrial
<i>Semnopithecus johnii</i>	Nilgiri Langur	MAMMALIA	VU	Stable	Terrestrial
<i>Duttaphrynus microtypanum</i>	Southern Hill Toad	AMPHIBIA	VU	Decreasing	Terrestrial
<i>Raorchestes glandulosus</i>	Southern Bubble-nest Frog	AMPHIBIA	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Raorchestes dubois</i>	Kodaikanal Bush Frog	AMPHIBIA	VU	Stable	Terrestrial
<i>Cnemaspis jerdonii</i>	Jerdon's Day Gecko	REPTILIA	VU	Unknown	Terrestrial
<i>Ophiophagus hannah</i>	King Cobra	REPTILIA	VU	Decreasing	Terrestrial
<i>Kaestlea laterimaculata</i>		REPTILIA	VU	Unknown	Terrestrial
<i>Anacyclus pyrethrum</i>	Atlas Daisy	MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Magnolia nilagirica</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Ocyrceros griseus</i>	Malabar Grey Hornbill	AVES	VU	Decreasing	Terrestrial
<i>Buceros bicornis</i>	Great Hornbill	AVES	VU	Decreasing	Terrestrial
<i>Columba elphinstonii</i>	Nilgiri Woodpigeon	AVES	VU	Decreasing	Terrestrial
<i>Ficedula subnubra</i>	Kashmir Flycatcher	AVES	VU	Decreasing	Terrestrial
<i>Pycnonotus xantholaemus</i>	Yellow-throated Bulbul	AVES	VU	Decreasing	Terrestrial
<i>Anthus nilghiriensis</i>	Nilgiri Pipit	AVES	VU	Decreasing	Terrestrial
<i>Clanga hastata</i>	Indian Spotted Eagle	AVES	VU	Decreasing	Terrestrial
<i>Sholicola albiventris</i>	White-bellied Sholakili	AVES	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Calophyllum apetalum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Cinnamomum sulphuratum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Hydnocarpus pentandrus</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Hopea ponga</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Funambulus sublineatus</i>	Dusky-striped Squirrel	MAMMALIA	VU	Decreasing	Terrestrial
<i>Nicephora subulata</i>	Palani Hills Bush-Cricket	INSECTA	VU	Decreasing	Terrestrial
<i>Oryza malampuzhaensis</i>		LILIOPSIDA	VU	Decreasing	Terrestrial
<i>Litsea keralana</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial

**APPENDIX 5: IBAT REPORT FOR 765 KV PACKAGE 5**

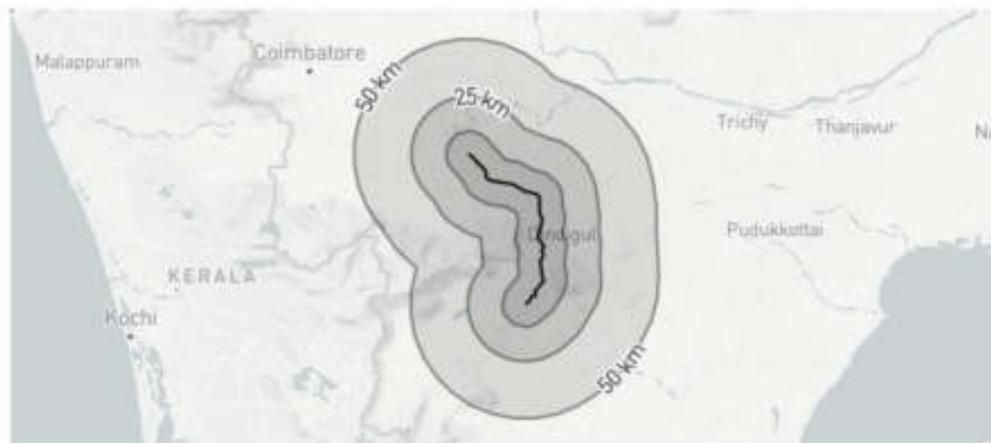


**Integrated Biodiversity Assessment Tool**  
**PROXIMITY REPORT**  
**REACH II - 765 KV**

Country: India  
 Location: [ 10.4, 77.8 ]  
 Date of analysis: 08 November 2021 (GMT)  
 Buffers applied: 10 km | 25 km | 50 km  
 IUCN Red List Biomes: Terrestrial, Freshwater  
 Generated by: Pushpanathan K  
 Organisation: ADB

**Overlaps with:**

Protected Areas	1
Key Biodiversity Areas	8
IUCN Red List	104



Displaying project location and buffers: 10 km, 25 km, 50 km



### Protected Areas

The following protected areas are found within 10 km, 25 km, 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Within buffer of
Western Ghats	50 km

### Key Biodiversity Areas

The following key biodiversity areas are found within 10 km, 25 km, 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Distance
Palni Hills (including Kodaikanal Reserve Forest)	10 km
Berijam (Kodaikanal)	50 km
Indira Gandhi Wildlife Sanctuary and National Park	50 km
Poomparai and Kukkal	50 km
Shola around Kodaikanal	50 km
Srivilliputhur Wildlife Sanctuary	50 km
Theni Forest Divisions	50 km
Vandivoorand Kunnathur Tanks (Madurai)	50 km

### IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Nilssonia leithii</i>	Leith's Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
<i>Fimbristylis hirsutifolia</i>		LILIOPSIDA	CR	Decreasing	Terrestrial, Freshwater
<i>Ardeotis nigriceps</i>	Great Indian Bustard	AVES	CR	Decreasing	Terrestrial
<i>Gyps bengalensis</i>	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
<i>Sarcogyps calvus</i>	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Hypselobarbus thomassi</i>	Red Canarese Barb	ACTINOPTERYGII	CR	Unknown	Freshwater
<i>Tor remadevii</i>	Hump-backed Mahseer	ACTINOPTERYGII	CR	Decreasing	Freshwater
<i>Cuon alpinus</i>	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
<i>Elephas maximus</i>	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
<i>Feroculus feroculus</i>	Kelaart's Long-clawed Shrew	MAMMALIA	EN	Decreasing	Terrestrial
<i>Vijayachelys silvatica</i>	Cochin Forest Cane Turtle	REPTILIA	EN	Decreasing	Terrestrial
<i>Nilgiritragus hylocrius</i>	Nilgiri Tahr	MAMMALIA	EN	Decreasing	Terrestrial
<i>Latidens salimalii</i>	Salim Ali's Fruit Bat	MAMMALIA	EN	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Manis crassicaudata</i>	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial
<i>Panthera tigris</i>	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
<i>Cinnamomum perrottetii</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Raorchestes travancoricus</i>	Travancore Bush Frog	AMPHIBIA	EN	Unknown	Terrestrial
<i>Rhacophorus calcadensis</i>	Kalakkad Tree Frog	AMPHIBIA	EN	Decreasing	Terrestrial, Freshwater
<i>Haploclostus kayi</i>	Parambikulam Large Burrowing Spider	ARACHNIDA	EN	Decreasing	Terrestrial
<i>Dasia subcaerulea</i>	Boulenger's Dasia	REPTILIA	EN	Unknown	Terrestrial
<i>Hydrocotyle conferta</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Fimbristylis crystallina</i>		LILIOPSIDA	EN	Unknown	Terrestrial, Freshwater
<i>Fimbristylis dauciformis</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Dimeria hohenackeri</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Platyplectrurus madurensis</i>	Travancore Hills Thorntail Snake	REPTILIA	EN	Unknown	Terrestrial
<i>Sypheotides indicus</i>	Lesser Florican	AVES	EN	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Sterna acuticauda</i>	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Neophron percnopterus</i>	Egyptian Vulture	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Aquila nipalensis</i>	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
<i>Cinnamomum wightii</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Dysoxylum malabaricum</i>	White Cedar	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Cinnamomum gamblei</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Cinnamomum keralaense</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Hipposideros pomona</i>	Andersen's Roundleaf Bat	MAMMALIA	EN	Decreasing	Terrestrial
<i>Garra hughi</i>	Cardamon Garra	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Nemacheilus pulchellus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Glyptothorax madraspatanus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Puntius cauverfensis</i>	Cauvery Barb	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Hypselobarbus dubius</i>	Nilgiri Barb	ACTINOPTERYGII	EN	Decreasing	Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Glyptothorax anamalaiensis</i>	Anamalai Sucker Catfish	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Hypselobarbus mussullah</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Tor malabaricus</i>	Malabar Mahseer	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Rotala ritchiei</i>		MAGNOLIOPSIDA	EN	Decreasing	Freshwater
<i>Cyathea crinita</i>		POLYPODIOPSIDA	EN	Decreasing	Freshwater
<i>Bos gaurus</i>	Gaur	MAMMALIA	VU	Decreasing	Terrestrial
<i>Crocodylus palustris</i>	Mugger	REPTILIA	VU	Stable	Terrestrial, Freshwater
<i>Lutrogale perspicillata</i>	Smooth-coated Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Macaca radiata</i>	Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Martes gwatkinsii</i>	Nilgiri Marten	MAMMALIA	VU	Stable	Terrestrial
<i>Melursus ursinus</i>	Sloth Bear	MAMMALIA	VU	Decreasing	Terrestrial
<i>Panthera pardus</i>	Leopard	MAMMALIA	VU	Decreasing	Terrestrial
<i>Platacanthomys lasiurus</i>	Malabar Spiny Tree Mouse	MAMMALIA	VU	Decreasing	Terrestrial
<i>Suncus montanus</i>	Sri Lanka Highland Shrew	MAMMALIA	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Shorea roxburghii</i>	White Meranti	MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Litsea nigrescens</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial
<i>Geochelone elegans</i>	Indian Star Tortoise	REPTILIA	VU	Decreasing	Terrestrial
<i>Macaca radiata</i> ssp. <i>radiata</i>	Dark-bellied Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Macaca radiata</i> ssp. <i>diluta</i>	Pale-bellied Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Rusa unicolor</i>	Sambar	MAMMALIA	VU	Decreasing	Terrestrial
<i>Aonyx cinereus</i>	Asian Small-clawed Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Semnopithecus johnii</i>	Nilgiri Langur	MAMMALIA	VU	Stable	Terrestrial
<i>Duttaphrynus microtympanum</i>	Southern Hill Toad	AMPHIBIA	VU	Decreasing	Terrestrial
<i>Micrixalus phyllophilus</i>	Nilgiri Dancing Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Nyctibatrachus major</i>	Malabar Night Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Raorchestes glandulosus</i>	Southern Bubble-nest Frog	AMPHIBIA	VU	Decreasing	Terrestrial
<i>Raorchestes dubois</i>	Koodaikanal Bush Frog	AMPHIBIA	VU	Stable	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Cnemaspis jerdonii</i>	Jerdon's Day Gecko	REPTILIA	VU	Unknown	Terrestrial
<i>Chlorogomphus xanthoptera</i>		INSECTA	VU	Unknown	Terrestrial, Freshwater
<i>Anaphalis beddomei</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial, Freshwater
<i>Anaphalis leptophylla</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Anaphalis wightiana</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Notonia shevaroyensis</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
<i>Ophiophagus hannah</i>	King Cobra	REPTILIA	VU	Decreasing	Terrestrial
<i>Anacyclus pyrethrum</i>	Atlas Daisy	MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Magnolia nilagirica</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Ocyrceros griseus</i>	Malabar Grey Hornbill	AVES	VU	Decreasing	Terrestrial
<i>Buceros bicornis</i>	Great Hornbill	AVES	VU	Decreasing	Terrestrial
<i>Columba elphinstonii</i>	Nilgiri Woodpigeon	AVES	VU	Decreasing	Terrestrial
<i>Gallinago nemoricola</i>	Wood Snipe	AVES	VU	Decreasing	Terrestrial, Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Sterna aurantia</i>	River Tern	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Leptoptilos javanicus</i>	Lesser Adjutant	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Ficedula subrubra</i>	Kashmir Flycatcher	AVES	VU	Decreasing	Terrestrial
<i>Pycnonotus xantholaemus</i>	Yellow-throated Bulbul	AVES	VU	Decreasing	Terrestrial
<i>Chaetomis striata</i>	Bristled Grassbird	AVES	VU	Decreasing	Terrestrial, Freshwater
<i>Anthus nilghiriensis</i>	Nilgiri Pipit	AVES	VU	Decreasing	Terrestrial
<i>Clanga hastata</i>	Indian Spotted Eagle	AVES	VU	Decreasing	Terrestrial
<i>Sholicola albiventris</i>	White-bellied Sholakili	AVES	VU	Decreasing	Terrestrial
<i>Calophyllum apetalum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Cinnamomum sulphuratum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Hydnocarpus pentandrus</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Funambulus sublineatus</i>	Dusky-striped Squirrel	MAMMALIA	VU	Decreasing	Terrestrial
<i>Nicephora subulata</i>	Palani Hills Bush-Cricket	INSECTA	VU	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Oryza malampuzhaensis</i>		LILIOPSIDA	VU	Decreasing	Terrestrial
<i>Lissemys punctata</i>	Indian Flapshell Turtle	REPTILIA	VU	Decreasing	Terrestrial, Freshwater
<i>Litsea keralana</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial
<i>Wallago attu</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Bagarius yarrelli</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Cirrhinus cirrhosus</i>	Mrigal Carp	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Garra menoni</i>	Silent Valley Stone Sucker	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Mesonoemacheilus pambarensis</i>	Pambar Banded Loach	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Hypselobarbus kolus</i>	Kolus Barb	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Horalabiosa palaniensis</i>		ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Ballitora mysorensis</i>	Slender Stone Loach	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Polypleurum filifolium</i>		MAGNOLIOPSIDA	VU	Unknown	Freshwater

## APPENDIX 6: IBAT REPORT FOR 765 KV PACKAGE 6

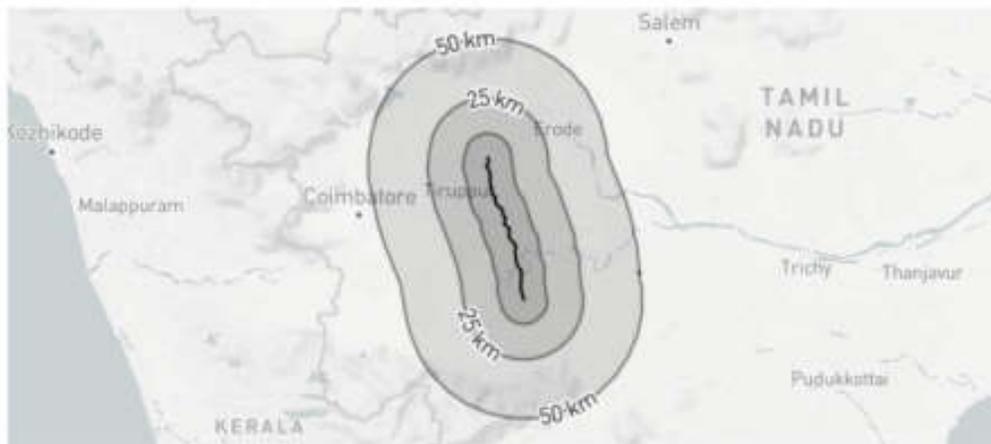


### Integrated Biodiversity Assessment Tool PROXIMITY REPORT 3. REACH III - 765 KV IBAT

Country: India  
 Location: [ 11, 77.5 ]  
 Date of analysis: 10 November 2021 (GMT)  
 Buffers applied: 10 km | 25 km | 50 km  
 IUCN Red List Biomes: Marine, Freshwater, Terrestrial  
 Generated by: Pushpanathan K  
 Organisation: ADB

**Overlaps with:**

Protected Areas	0
Key Biodiversity Areas	6
IUCN Red List	109



Displaying project location and buffers: 10 km, 25 km, 50 km





### Protected Areas

The following protected areas are found within 10 km, 25 km, 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

No protected areas within buffer distance

### Key Biodiversity Areas

The following key biodiversity areas are found within 10 km, 25 km, 50 km of the area of interest.

For further details please refer to the associated csv file in the report folder.

Area name	Distance
Erode Forest Division	50 km
Indira Gandhi Wildlife Sanctuary and National Park	50 km
Palni Hills (including Kodaikanal Reserve Forest)	50 km
Poomparai and Kukkal	50 km
Sathyamangalam Forest Division (part)	50 km
Talaimalai Reserve Forest	50 km

### IUCN Red List of Threatened Species

The following threatened species are potentially found within 50km of the area of interest.

For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Nilssononia leithii	Leith's Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Hypselobarbus thomassi</i>	Red Canarese Barb	ACTINOPTERYGII	CR	Unknown	Freshwater
<i>Hemibagrus punctatus</i>	Nilgiri Mystus	ACTINOPTERYGII	CR	Decreasing	Freshwater
<i>Fimbristylis hirsutifolia</i>		LILIOPSIDA	CR	Decreasing	Terrestrial, Freshwater
<i>Nymphoides sivarajanii</i>		MAGNOLIOPSIDA	CR	Decreasing	Terrestrial, Freshwater
<i>Ardeotis nigriceps</i>	Great Indian Bustard	AVES	CR	Decreasing	Terrestrial
<i>Gyps bengalensis</i>	White-rumped Vulture	AVES	CR	Decreasing	Terrestrial
<i>Sarcogyps calvus</i>	Red-headed Vulture	AVES	CR	Decreasing	Terrestrial
<i>Gyps indicus</i>	Indian Vulture	AVES	CR	Decreasing	Terrestrial
<i>Tor remadevii</i>	Hump-backed Mahseer	ACTINOPTERYGII	CR	Decreasing	Freshwater
<i>Cuon alpinus</i>	Dhole	MAMMALIA	EN	Decreasing	Terrestrial
<i>Elephas maximus</i>	Asian Elephant	MAMMALIA	EN	Decreasing	Terrestrial
<i>Feroculus feroculus</i>	Kelaart's Long-clawed Shrew	MAMMALIA	EN	Decreasing	Terrestrial
<i>Vijayachelys silvatica</i>	Cochin Forest Cane Turtle	REPTILIA	EN	Decreasing	Terrestrial
<i>Nilgiritragus hylocrius</i>	Nilgiri Tahr	MAMMALIA	EN	Decreasing	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Latidens salimalii</i>	Salim Ali's Fruit Bat	MAMMALIA	EN	Decreasing	Terrestrial
<i>Manis crassicaudata</i>	Indian Pangolin	MAMMALIA	EN	Decreasing	Terrestrial
<i>Panthera tigris</i>	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
<i>Cinnamomum perrottetii</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Rhacophorus calcadensis</i>	Kalakkad Tree Frog	AMPHIBIA	EN	Decreasing	Terrestrial, Freshwater
<i>Haploclostus kayi</i>	Parambikulam Large Burrowing Spider	ARACHNIDA	EN	Decreasing	Terrestrial
<i>Schismatorhynchus nukta</i>	Nukta	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Garra hughi</i>	Cardamon Garra	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Labeo potail</i>	Deccan Labeo	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Nemacheilus pulchellus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Glyptothorax madraspatanus</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Puntius cauveriensis</i>	Cauvery Barb	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Silonia childreni</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Hypselobarbus dubius</i>	Nilgiri Barb	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Glyptothorax anamalaiensis</i>	Anamalai Sucker Catfish	ACTINOPTERYGII	EN	Unknown	Freshwater
<i>Hypselobarbus micropogon</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Devario neilgherriensis</i>	Nilgiri Danio	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Hypselobarbus mussullah</i>		ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Tor malabaricus</i>	Malabar Mahseer	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Pterocryptis wynaadensis</i>	Malabar Silurus	ACTINOPTERYGII	EN	Decreasing	Freshwater
<i>Hydrocotyle conferta</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Fimbristylis crystallina</i>		LILIOPSIDA	EN	Unknown	Terrestrial, Freshwater
<i>Fimbristylis dauciformis</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Dimeria hohenackeri</i>		LILIOPSIDA	EN	Decreasing	Terrestrial, Freshwater
<i>Rotala ritchiei</i>		MAGNOLIOPSIDA	EN	Decreasing	Freshwater
<i>Platyplectrurus madurensis</i>	Travancore Hills Thorntail Snake	REPTILIA	EN	Unknown	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Cyathea crinita</i>		POLYPODIOPSIDA	EN	Decreasing	Freshwater
<i>Nymphoides krishnakasara</i>		MAGNOLIOPSIDA	EN	Decreasing	Freshwater
<i>Sypheotides indicus</i>	Lesser Florican	AVES	EN	Decreasing	Terrestrial
<i>Sterna acuticauda</i>	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Neophron percnopterus</i>	Egyptian Vulture	AVES	EN	Decreasing	Terrestrial, Freshwater
<i>Aquila nipalensis</i>	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
<i>Cinnamomum wightii</i>		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Dysoxylum malabaricum</i>	White Cedar	MAGNOLIOPSIDA	EN	Decreasing	Terrestrial
<i>Hipposideros pomona</i>	Andersen's Roundleaf Bat	MAMMALIA	EN	Decreasing	Terrestrial
<i>Bos gaurus</i>	Gaur	MAMMALIA	VU	Decreasing	Terrestrial
<i>Crocodylus palustris</i>	Mugger	REPTILIA	VU	Stable	Terrestrial, Freshwater
<i>Lutrogale perspicillata</i>	Smooth-coated Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Macaca radiata</i>	Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Martes gwatkinsii</i>	Nilgiri Marten	MAMMALIA	VU	Stable	Terrestrial



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Melursus ursinus</i>	Sloth Bear	MAMMALIA	VU	Decreasing	Terrestrial
<i>Panthera pardus</i>	Leopard	MAMMALIA	VU	Decreasing	Terrestrial
<i>Platacanthomys lasiurus</i>	Malabar Spiny Tree Mouse	MAMMALIA	VU	Decreasing	Terrestrial
<i>Litsea nigrescens</i>		MAGNOLIOPSIDA	VU	Unknown	Terrestrial
<i>Geochelone elegans</i>	Indian Star Tortoise	REPTILIA	VU	Decreasing	Terrestrial
<i>Macaca radiata ssp. radiata</i>	Dark-bellied Bonnet Macaque	MAMMALIA	VU	Decreasing	Terrestrial
<i>Rusa unicolor</i>	Sambar	MAMMALIA	VU	Decreasing	Terrestrial
<i>Aconyx cinereus</i>	Asian Small-clawed Otter	MAMMALIA	VU	Decreasing	Terrestrial, Marine, Freshwater
<i>Duttaphrynus microtypanum</i>	Southern Hill Toad	AMPHIBIA	VU	Decreasing	Terrestrial
<i>Micrixalus phyllophilus</i>	Nilgiri Dancing Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Nyctibatrachus major</i>	Malabar Night Frog	AMPHIBIA	VU	Decreasing	Terrestrial, Freshwater
<i>Raorchestes glandulosus</i>	Southern Bubble-nest Frog	AMPHIBIA	VU	Decreasing	Terrestrial
<i>Oziothelphusa wagrakarowensis</i>		MALACOSTRACA	VU	Unknown	Freshwater
<i>Wallago attu</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater



Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Bagarius yarrelli</i>		ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Cirrhinus cirrhosus</i>	Mrigal Carp	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Garra menoni</i>	Silent Valley Stone Sucker	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Mesonoemacheilus pambarensis</i>	Pambar Banded Loach	ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Hypselobarbus kolus</i>	Kolus Barb	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Horallabiosa palaniensis</i>		ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Balitora mysorensis</i>	Slender Stone Loach	ACTINOPTERYGII	VU	Decreasing	Freshwater
<i>Puntius mudumalaiensis</i>		ACTINOPTERYGII	VU	Unknown	Freshwater
<i>Cnemaspis jerdonii</i>	Jerdon's Day Gecko	REPTILIA	VU	Unknown	Terrestrial
<i>Cnemaspis indica</i>	Nilgiri Dwarf Gecko	REPTILIA	VU	Unknown	Terrestrial
<i>Chlorogomphus xanthoptera</i>		INSECTA	VU	Unknown	Terrestrial, Freshwater
<i>Protosticta sanguinostigma</i>		INSECTA	VU	Unknown	Terrestrial, Freshwater
<i>Anaphalis beddomei</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial, Freshwater
<i>Polypleurum filifolium</i>		MAGNOLIOPSIDA	VU	Unknown	Freshwater

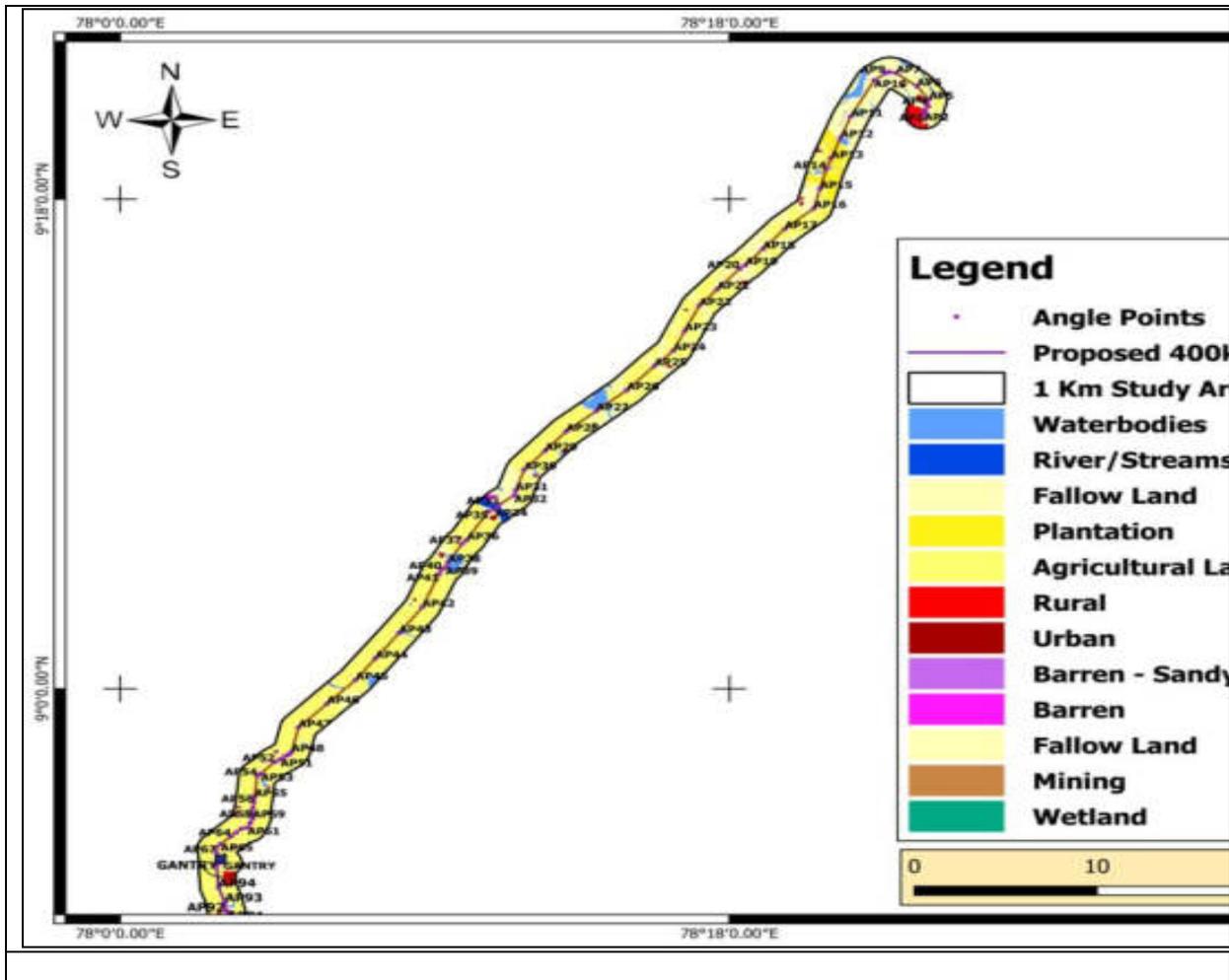


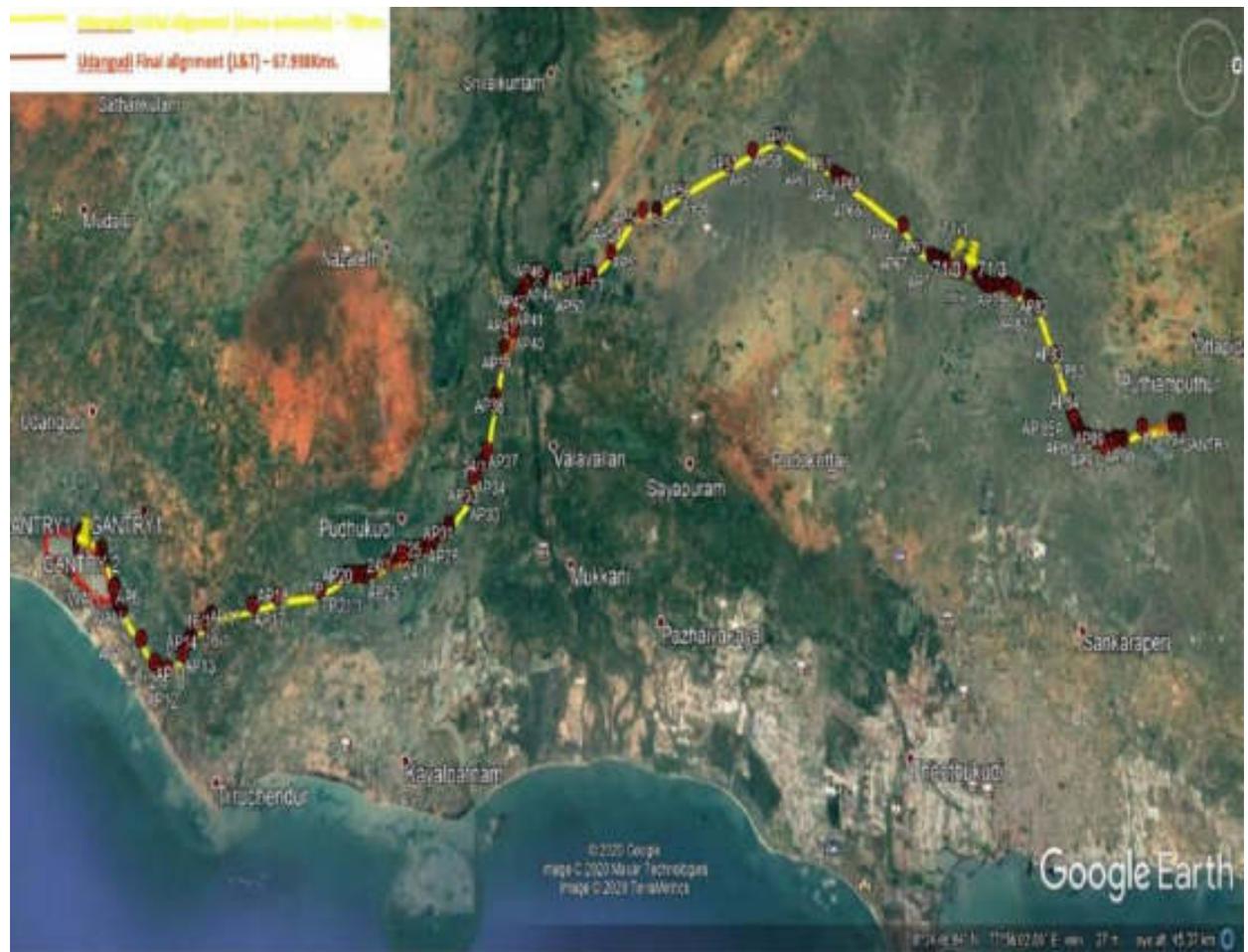
Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Anaphalis leptophylla		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
Anaphalis wightiana		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
Notonia shevaroyensis		MAGNOLIOPSIDA	VU	Unknown	Terrestrial, Freshwater
Ophiophagus hannah	King Cobra	REPTILIA	VU	Decreasing	Terrestrial
Anacyclus pyrethrum	Atlas Daisy	MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
Magnolia nilagirica		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
Ocyrocus griseus	Malabar Grey Hornbill	AVES	VU	Decreasing	Terrestrial
Buceros bicornis	Great Hornbill	AVES	VU	Decreasing	Terrestrial
Columba elphinstonii	Nilgiri Woodpigeon	AVES	VU	Decreasing	Terrestrial
Gallinago nemoricola	Wood Snipe	AVES	VU	Decreasing	Terrestrial, Freshwater
Sterna aurantia	River Tern	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
Leptoptilos javanicus	Lesser Adjutant	AVES	VU	Decreasing	Terrestrial, Marine, Freshwater
Ficedula subrubra	Kashmir Flycatcher	AVES	VU	Decreasing	Terrestrial



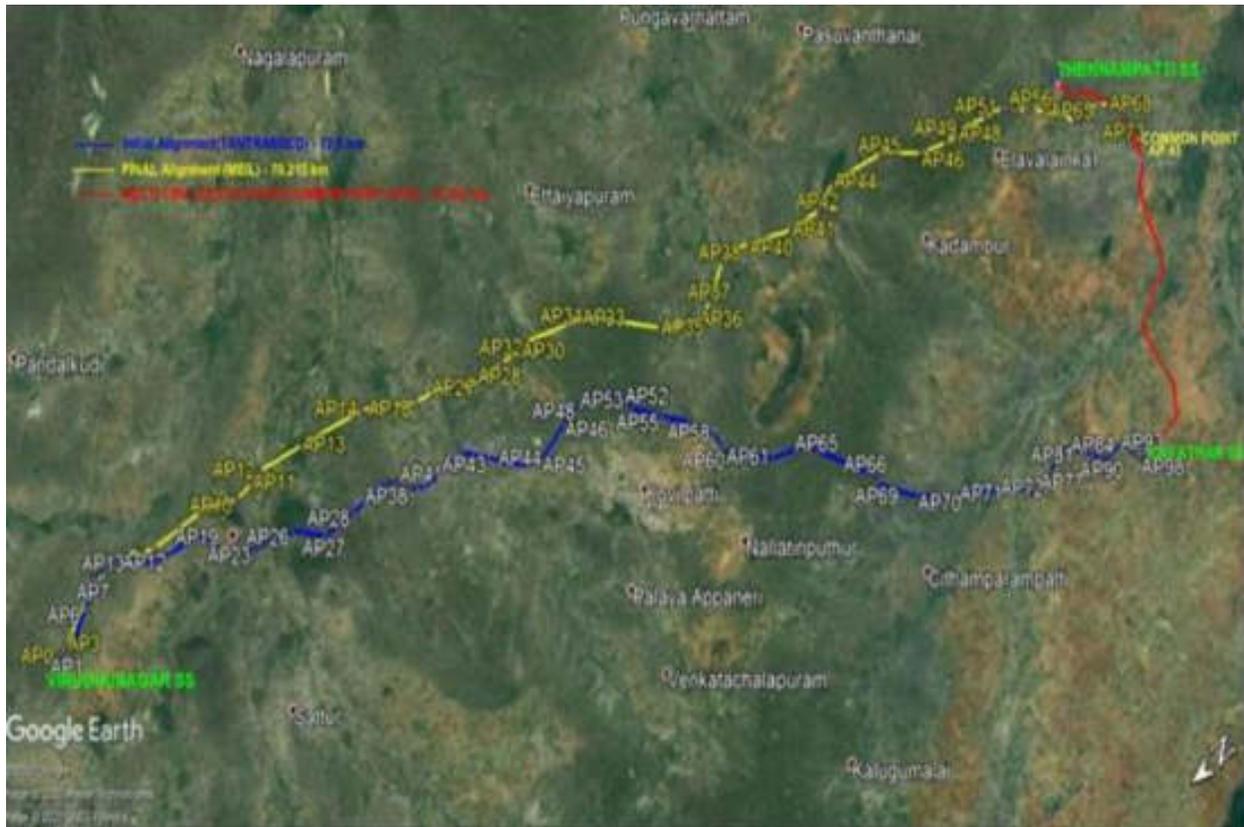
Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
<i>Machlophus nuchalis</i>	White-naped Tit	AVES	VU	Decreasing	Terrestrial
<i>Pycnonotus xantholaemus</i>	Yellow-throated Bulbul	AVES	VU	Decreasing	Terrestrial
<i>Chaetornis striata</i>	Bristled Grassbird	AVES	VU	Decreasing	Terrestrial, Freshwater
<i>Anthus nilghiriensis</i>	Nilgiri Pipit	AVES	VU	Decreasing	Terrestrial
<i>Clanga hastata</i>	Indian Spotted Eagle	AVES	VU	Decreasing	Terrestrial
<i>Sholicola albiventris</i>	White-bellied Sholakill	AVES	VU	Decreasing	Terrestrial
<i>Calophyllum apetalum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Cinnamomum sulphuratum</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Hydnocarpus pentandrus</i>		MAGNOLIOPSIDA	VU	Decreasing	Terrestrial
<i>Funambulus sublineatus</i>	Dusky-striped Squirrel	MAMMALIA	VU	Decreasing	Terrestrial
<i>Nicephora subulata</i>	Palani Hills Bush-Cricket	INSECTA	VU	Decreasing	Terrestrial
<i>Oryza malampuzhaensis</i>		LILIOPSIDA	VU	Decreasing	Terrestrial
<i>Lissemys punctata</i>	Indian Flapshell Turtle	REPTILIA	VU	Decreasing	Terrestrial, Freshwater

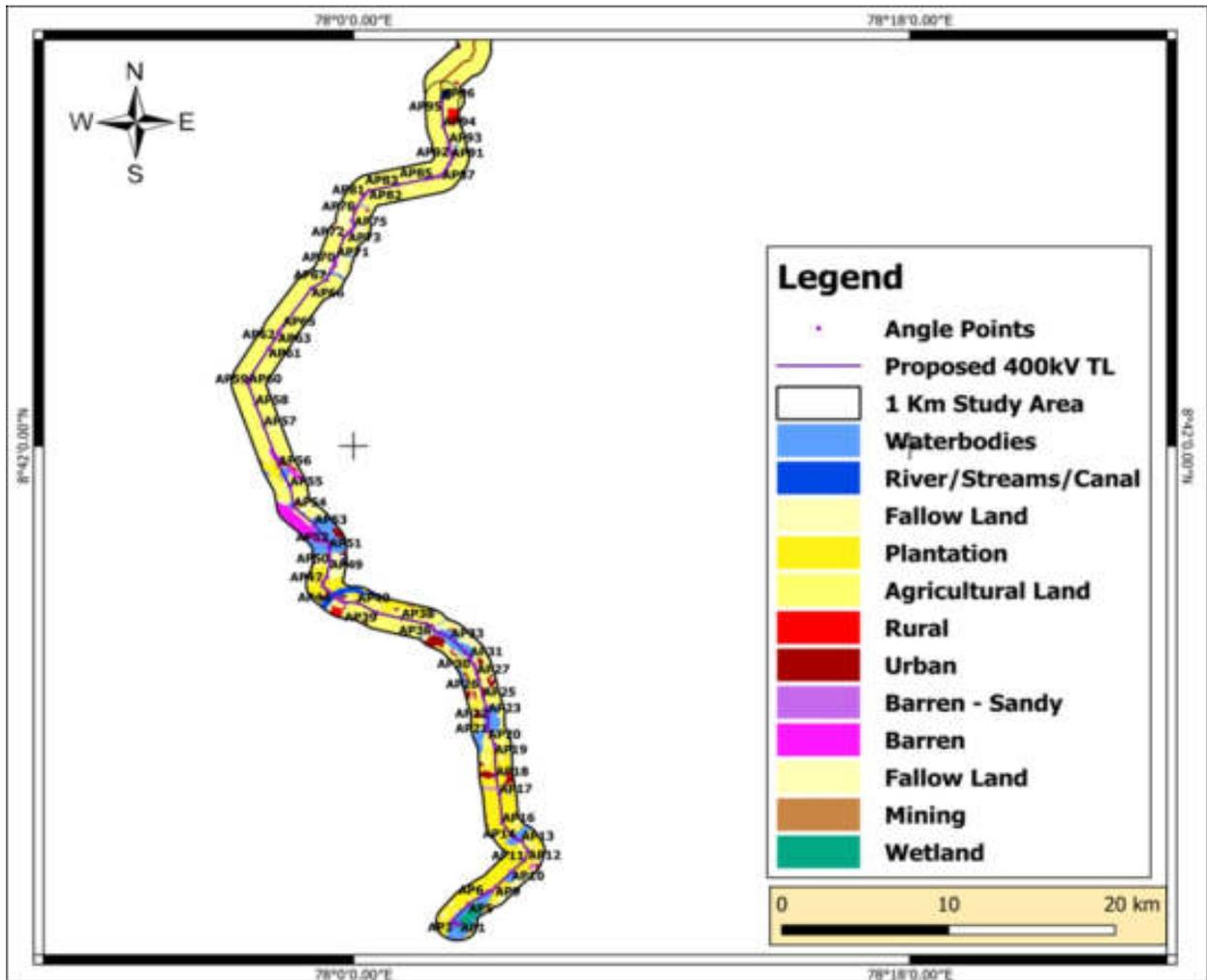


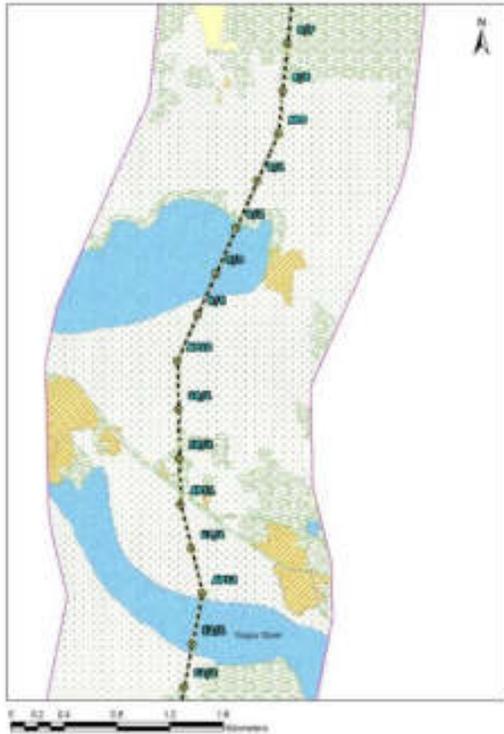
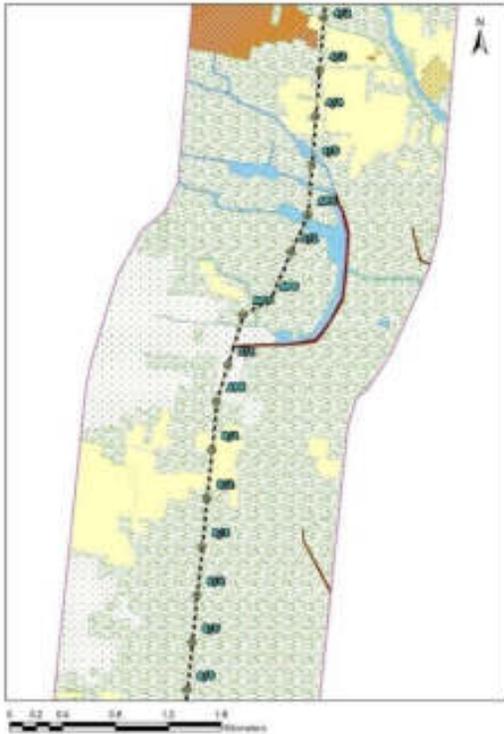
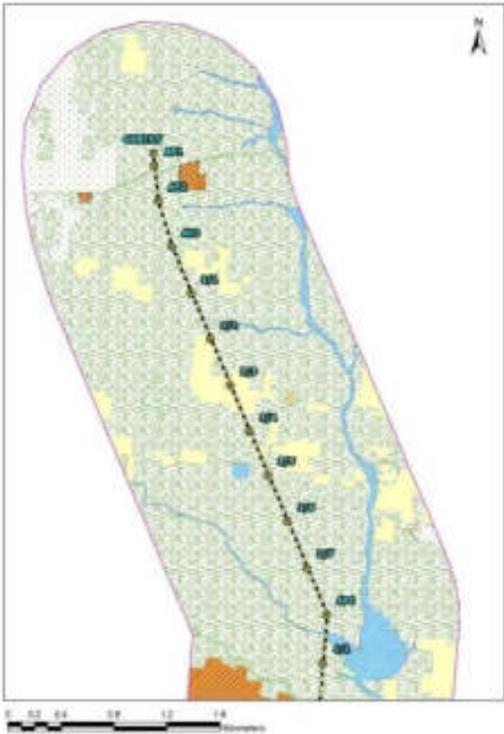




### Package 3 (400 kV Transmission Lines associated with Virudhunagar Substation)

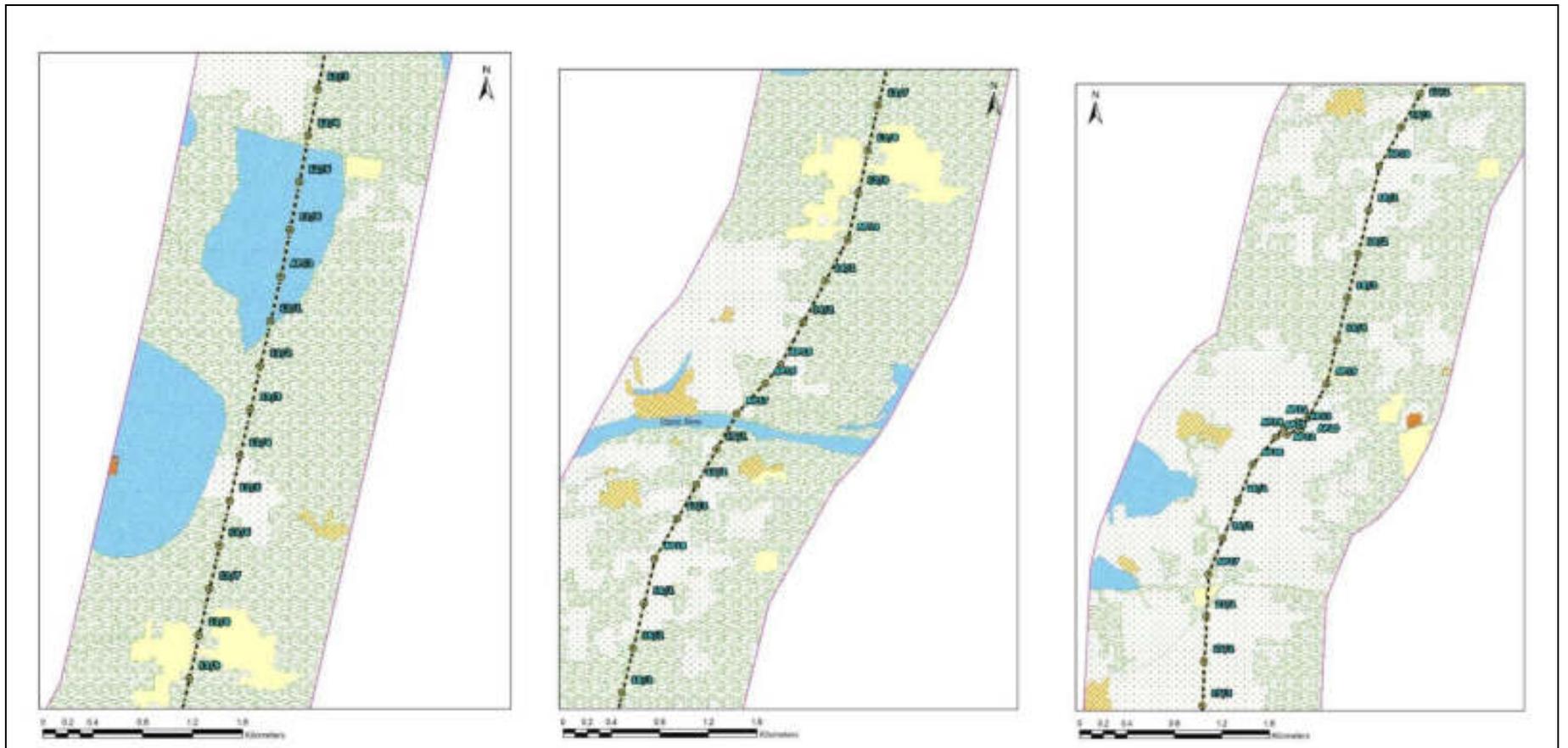


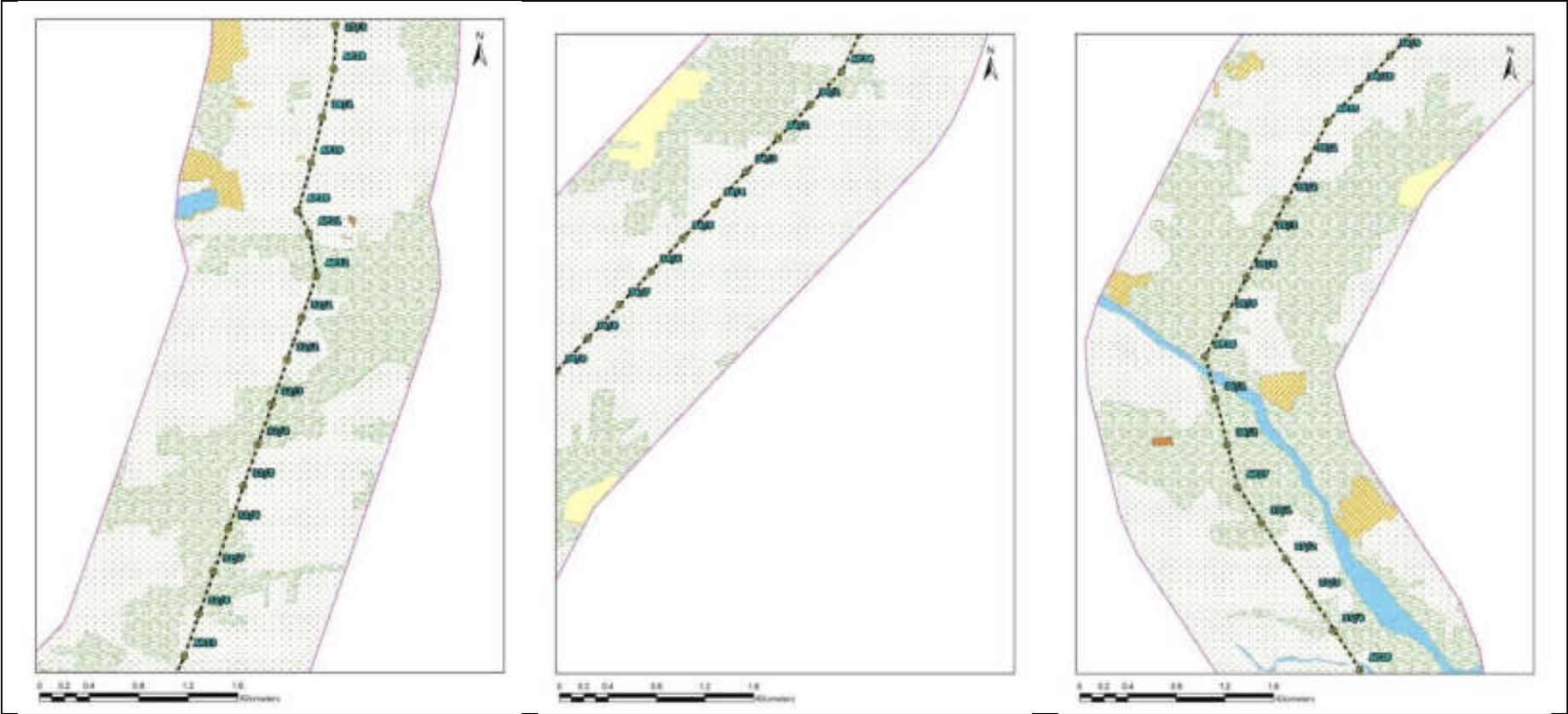


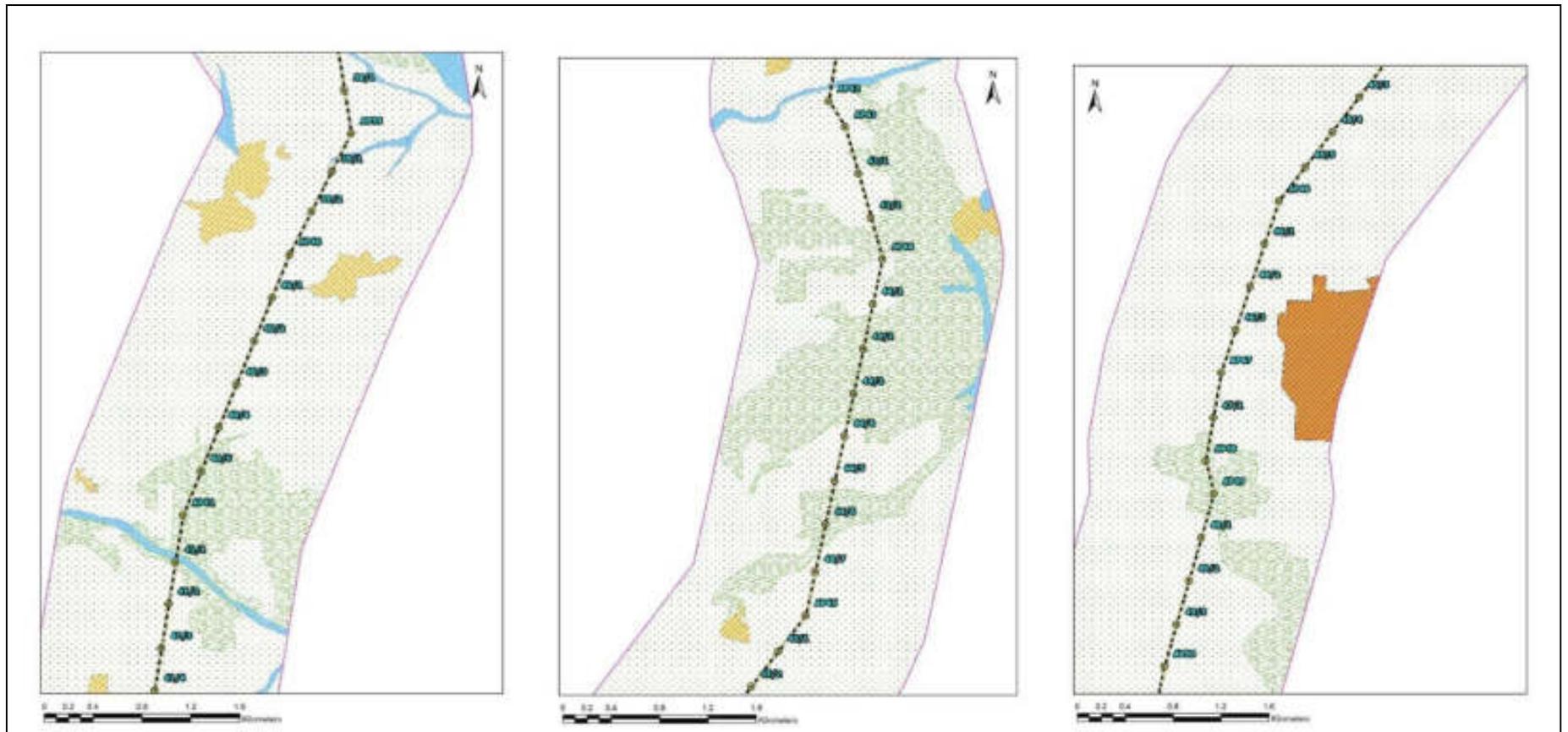


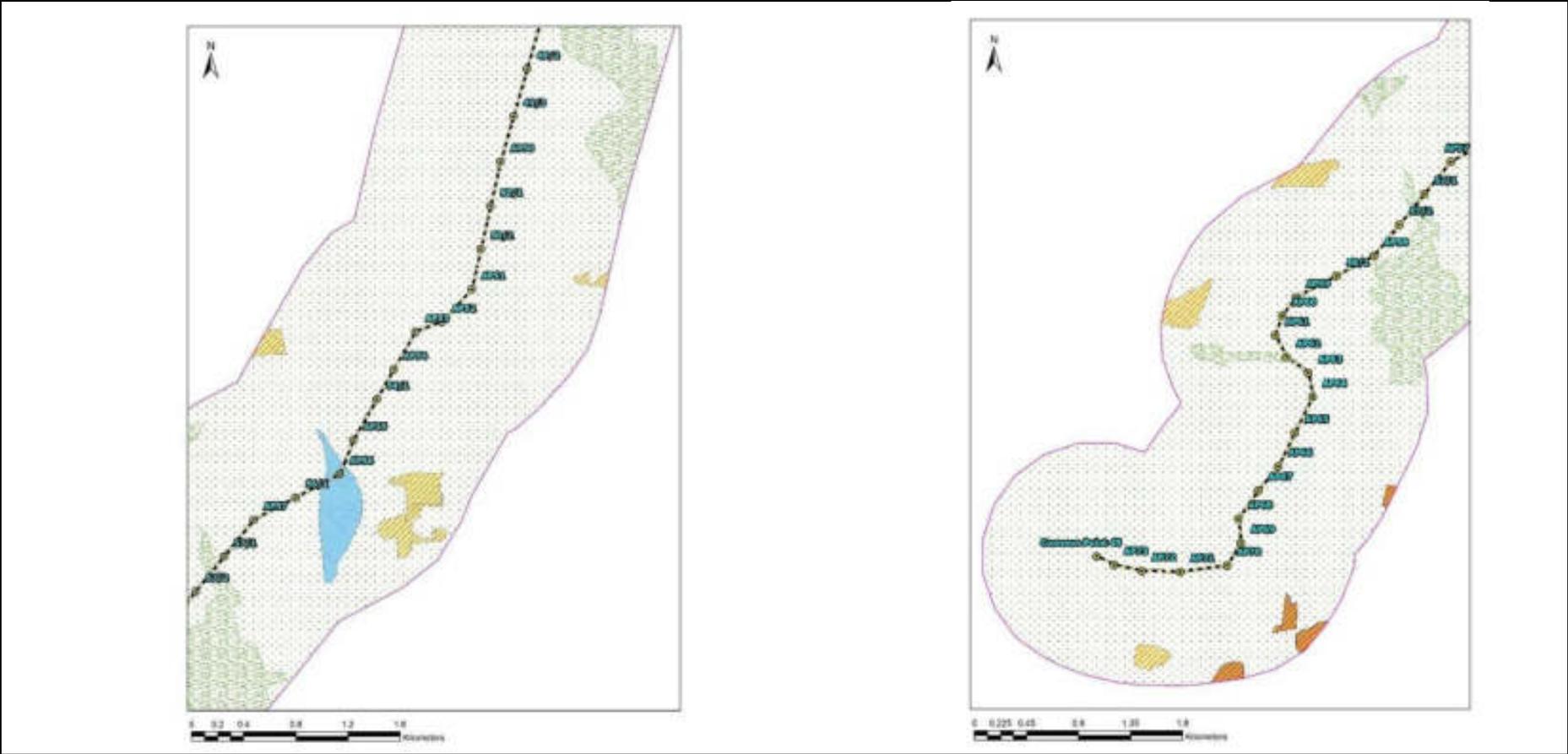
- Legend:**
- Crop Land
  - Fallow Land
  - Industrial Settlement
  - Land with scrub
  - Rubble Bund
  - Urban Settlement
  - Water Body

Land Use and Land Cover Map



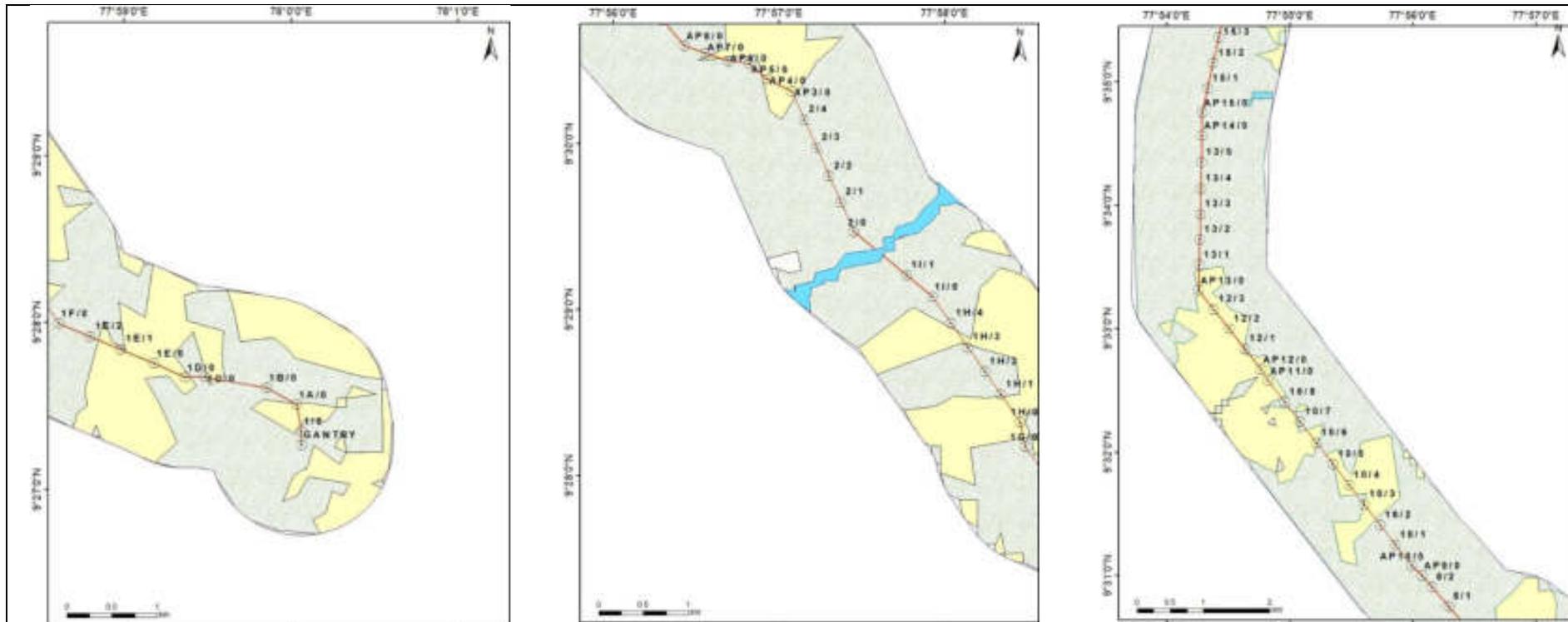




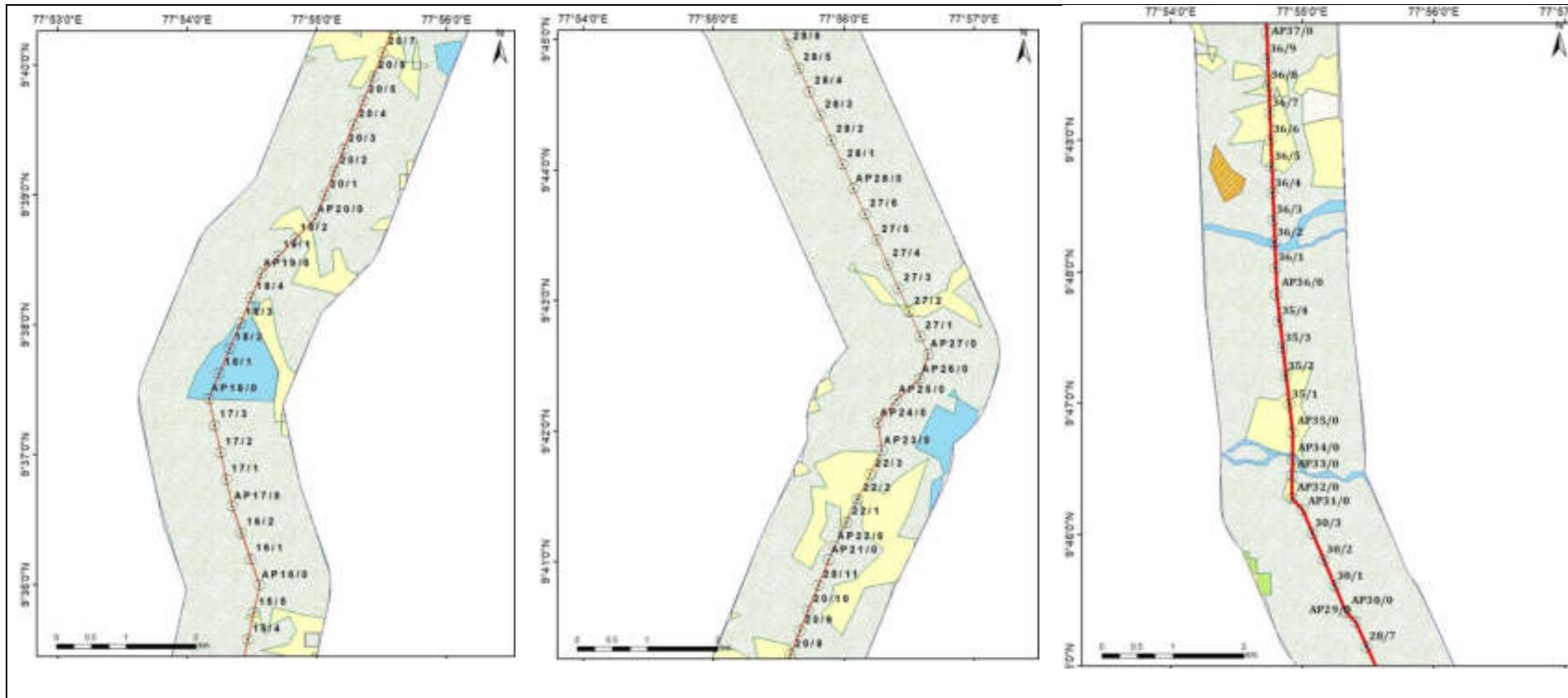


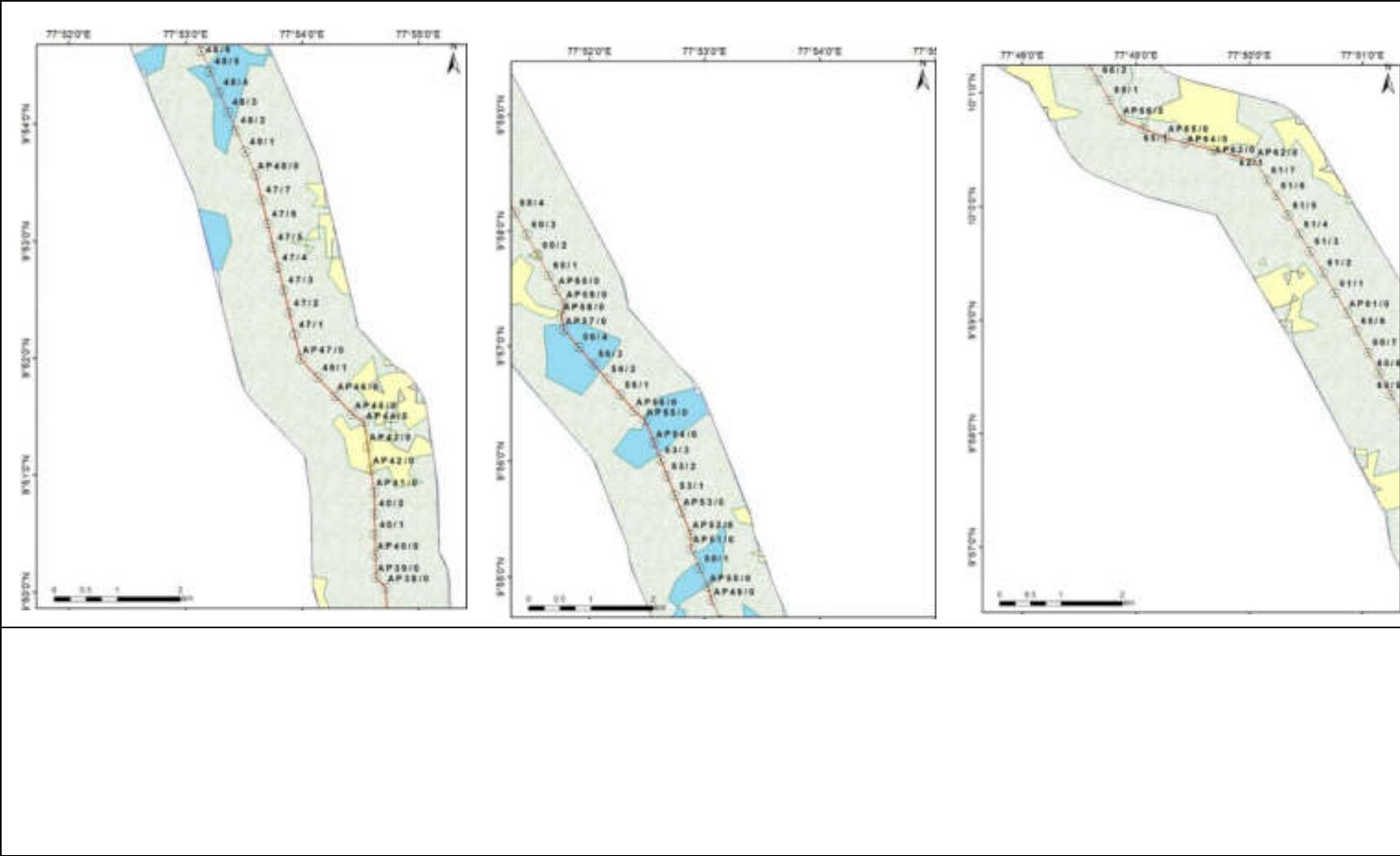
Package 4 (765 kV Transmission lines Package 1 associated with Virudhunagar Substation)

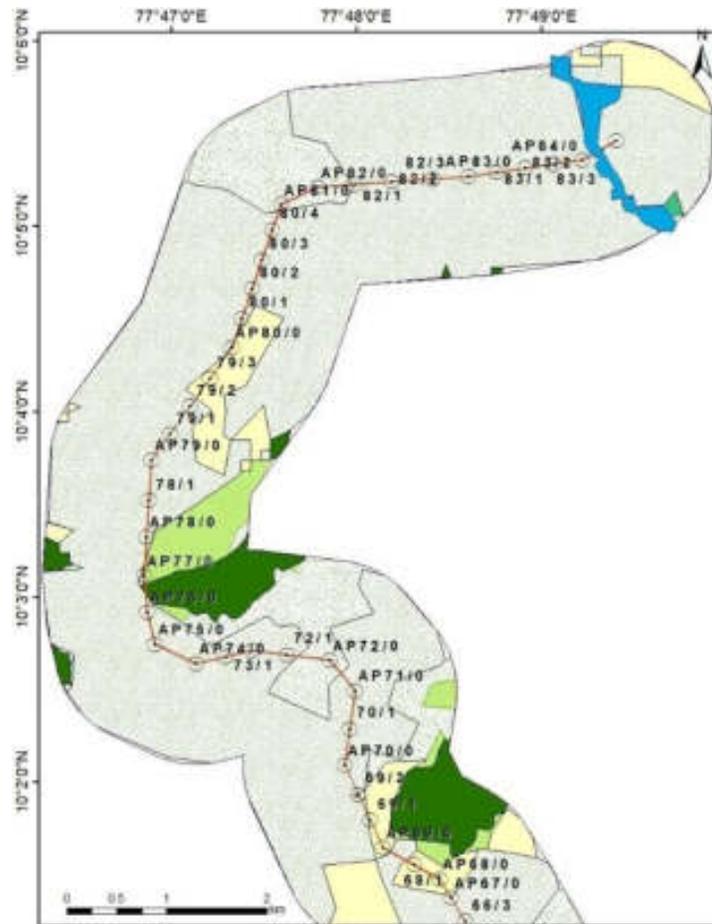




Land Use and Land Cover Map

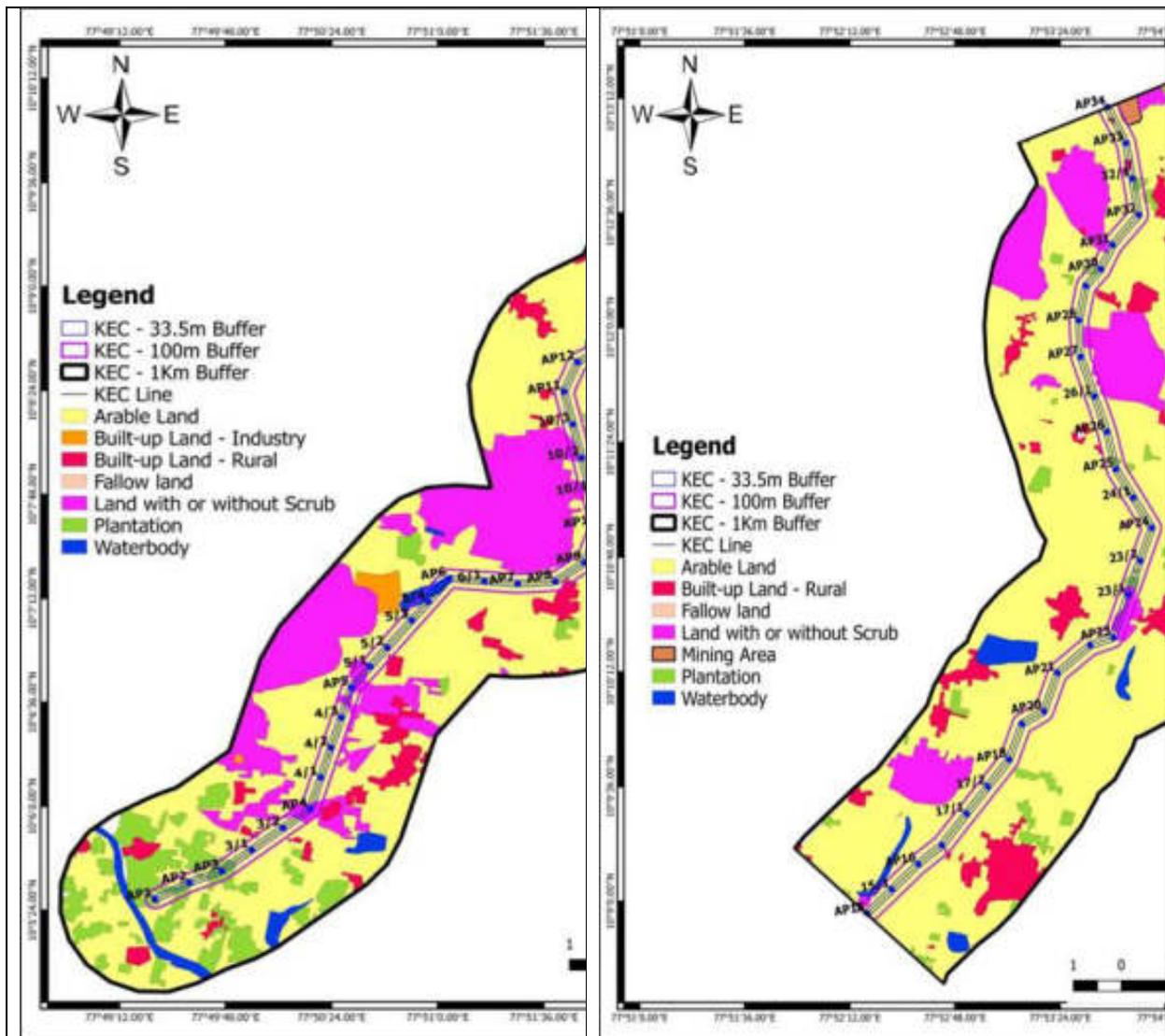


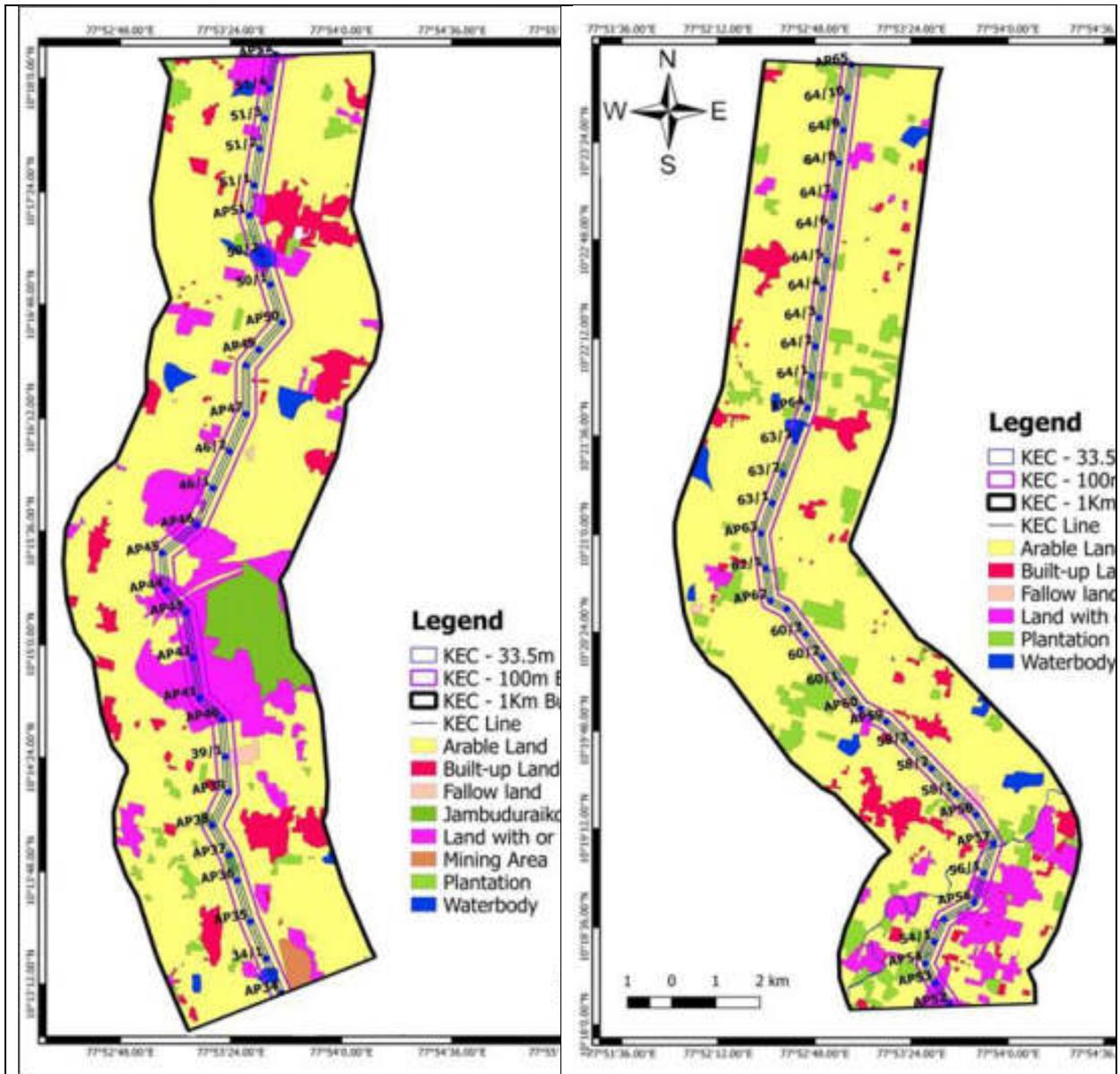


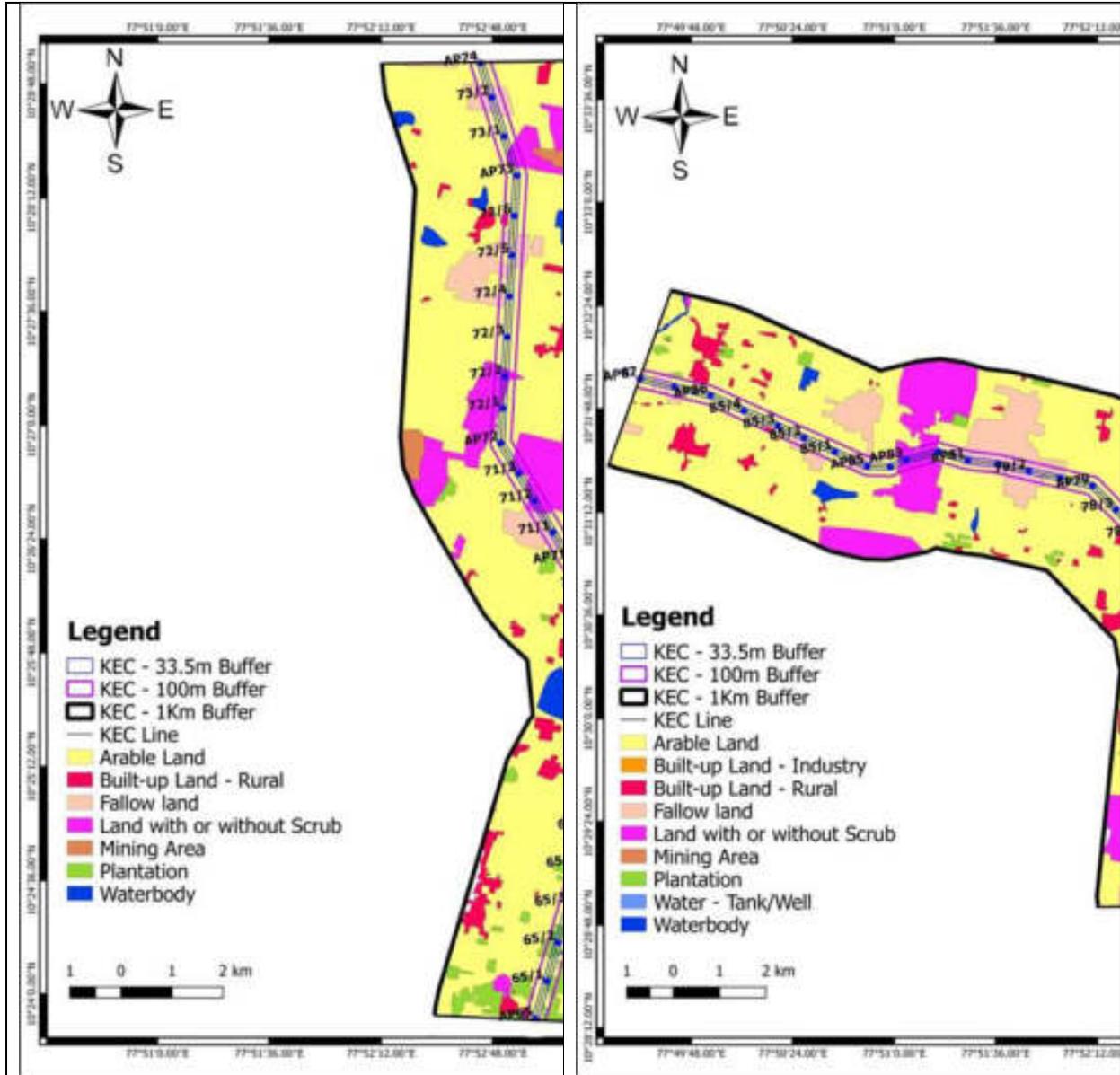


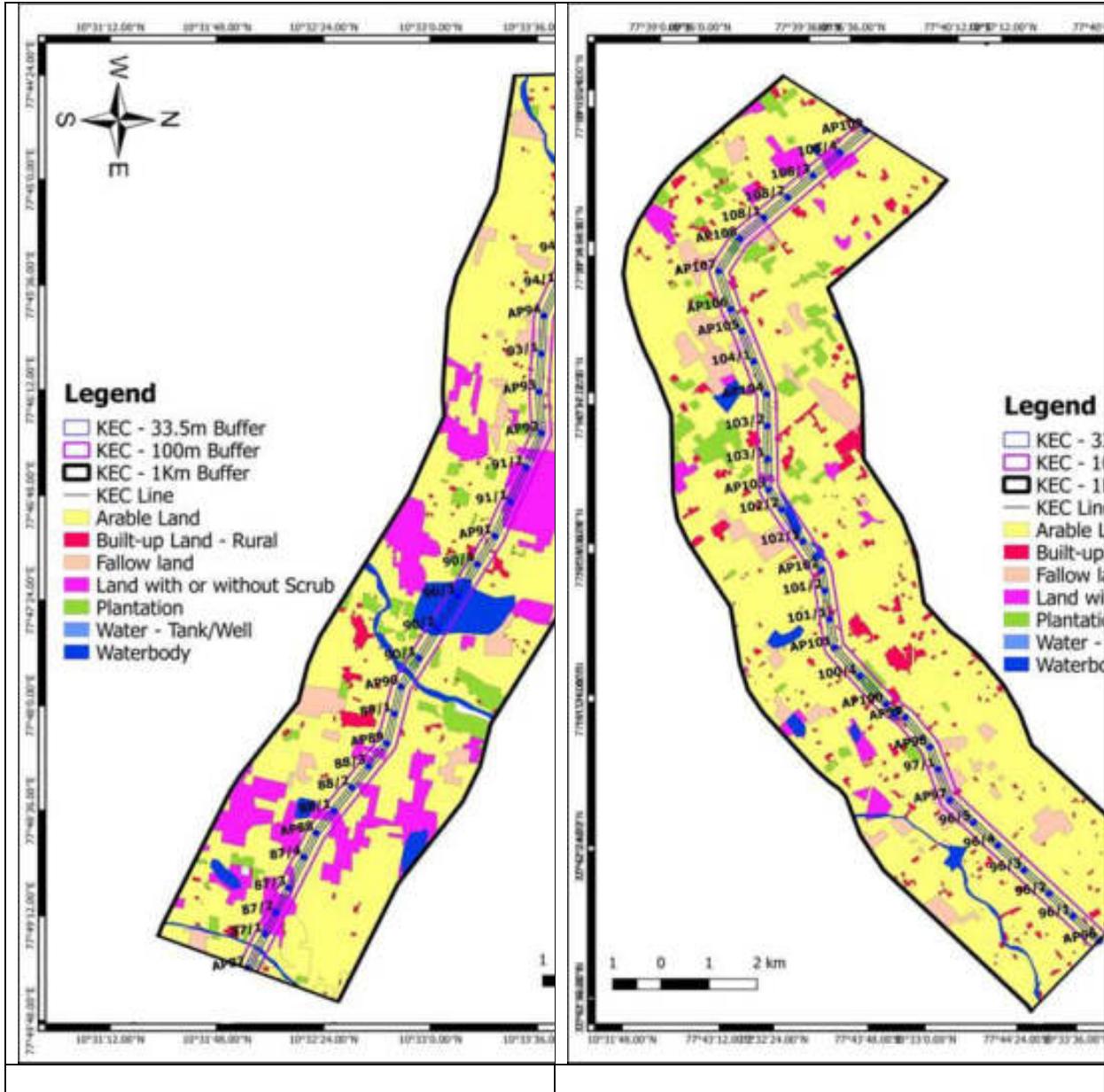
**Package 5 (765 kV Transmission lines Package 2 Associated with Virudhunagar Substation)**

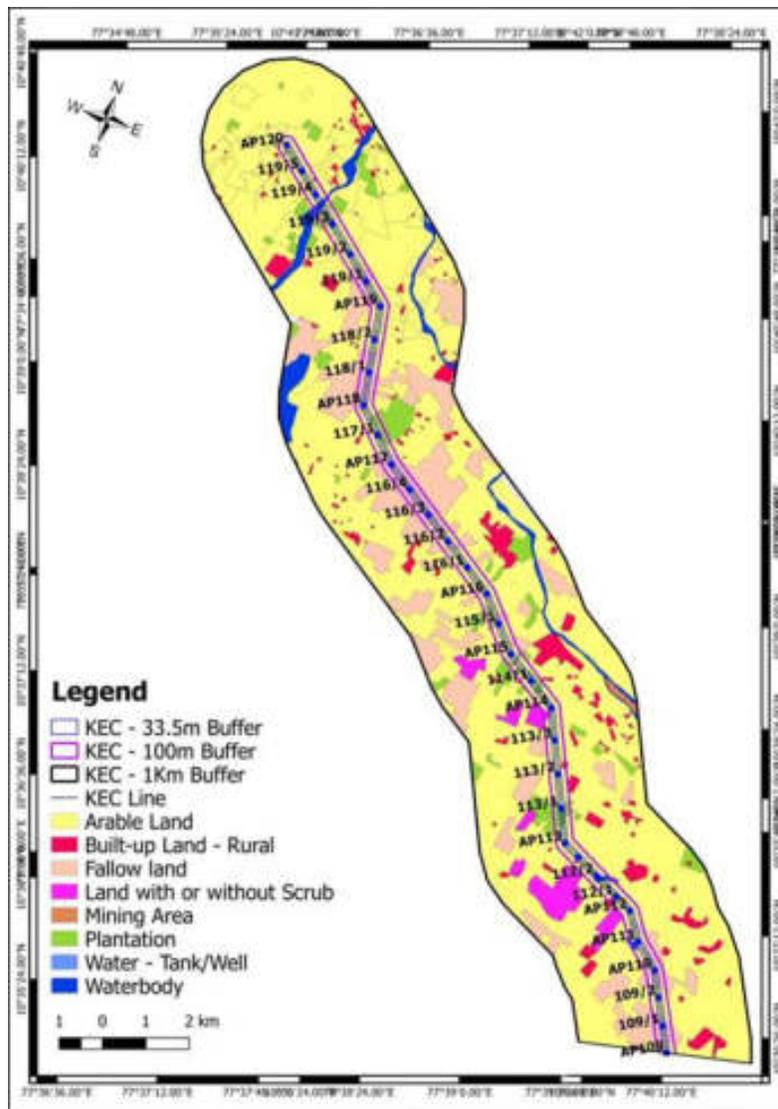






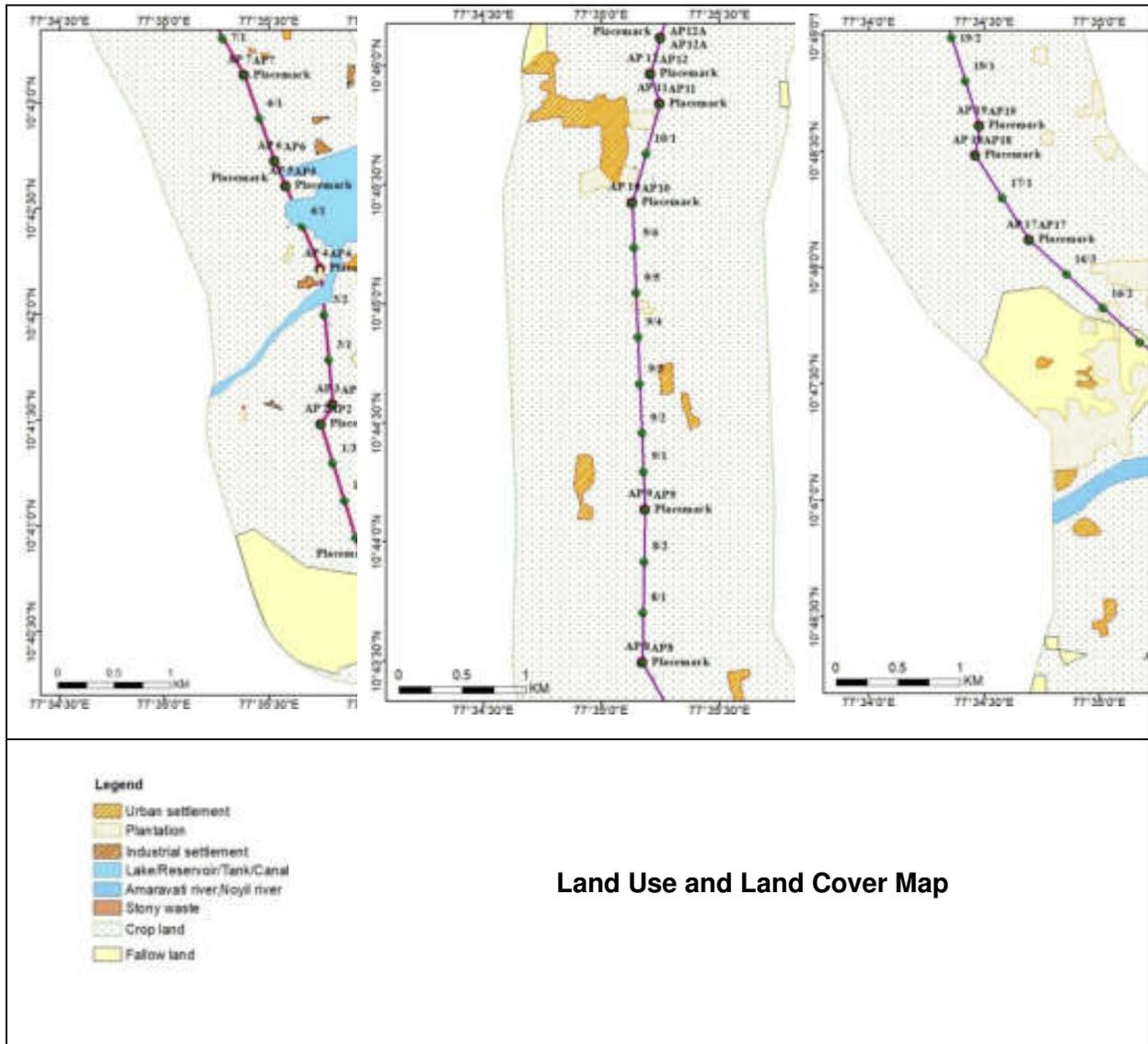


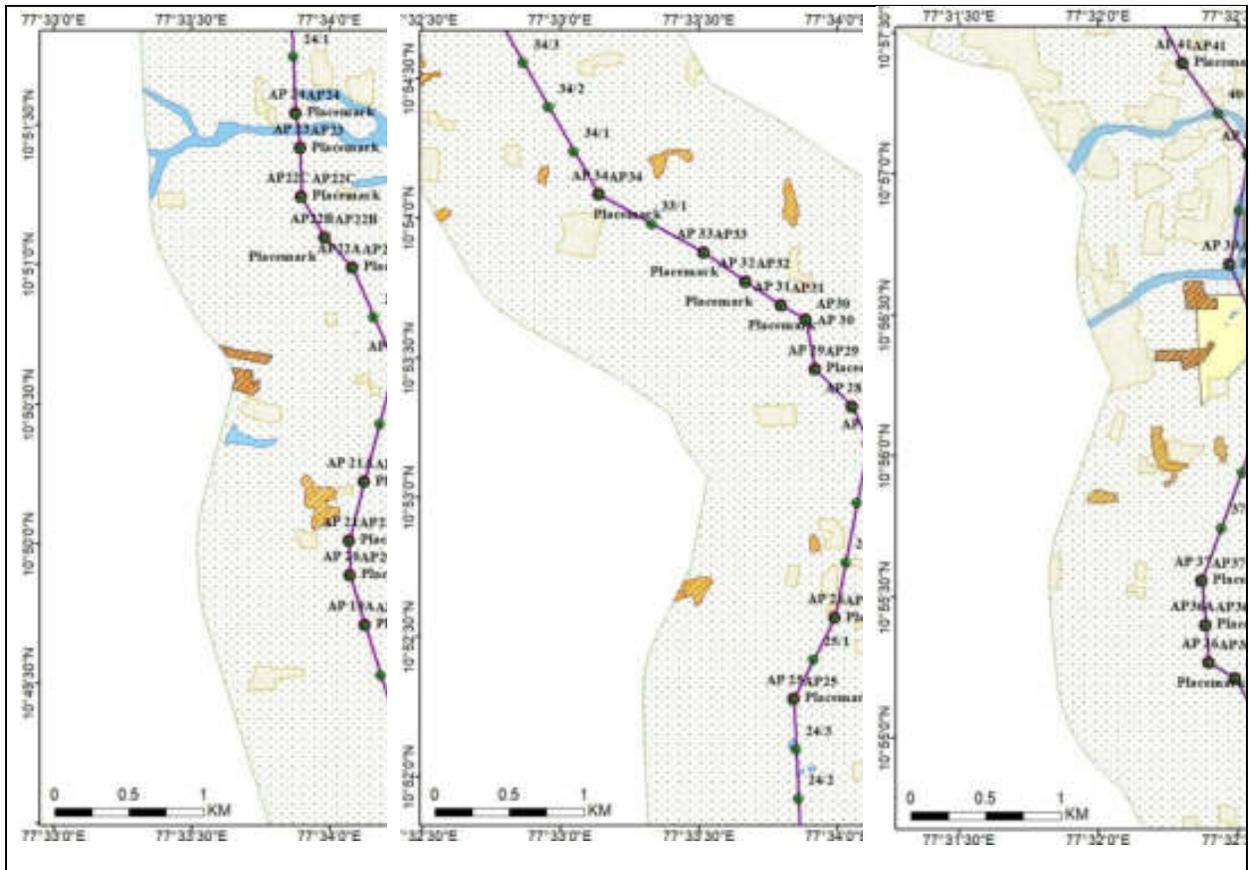


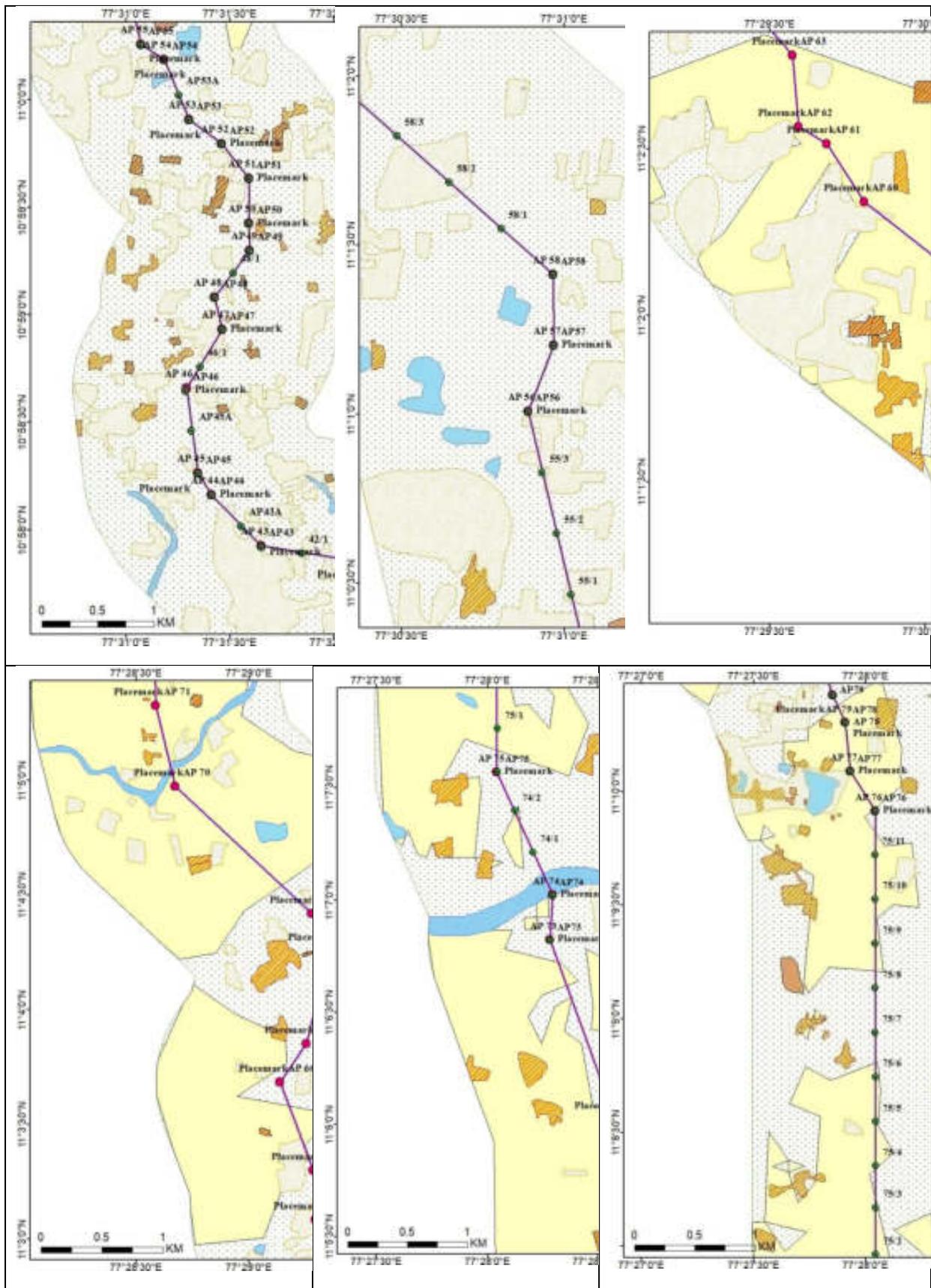


### Package 6 (765 kV Transmission lines Package 3 Associated with Virudhunagar Substation)



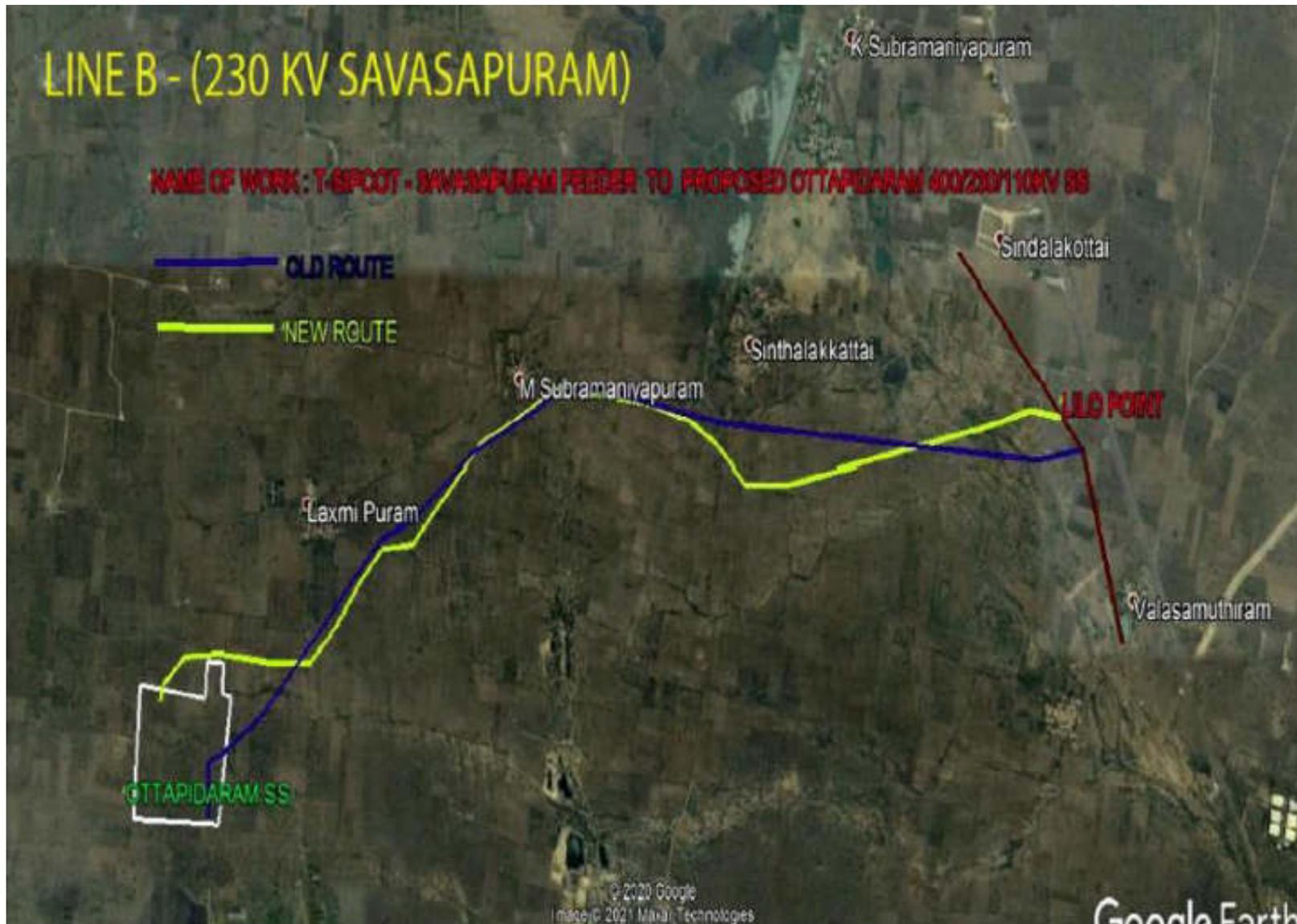


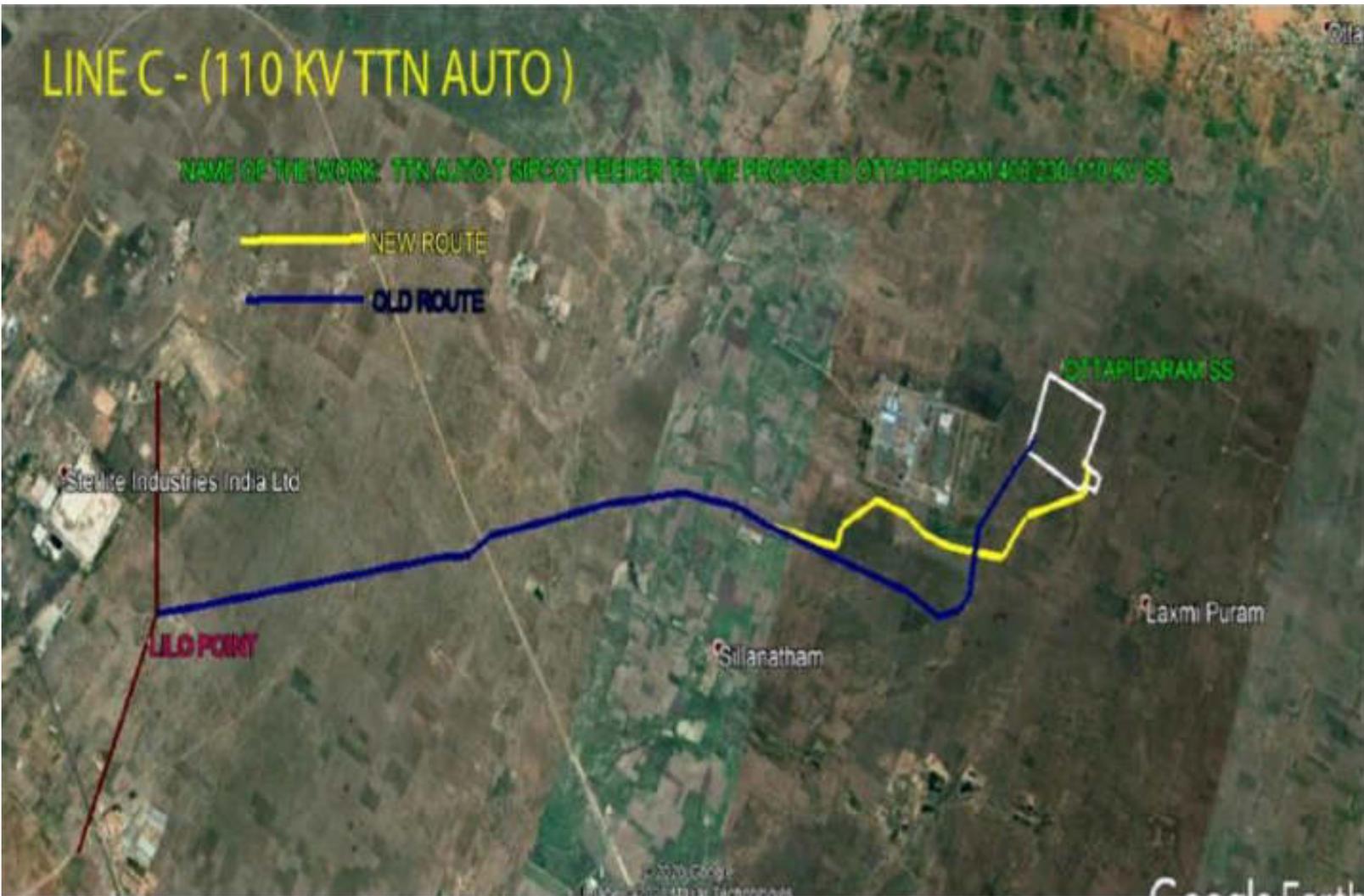




Package 7 (230 and 110 kV Transmission Lines Associated with Ottapidaram Substation)













Land Use and Land Cover Map

