CHAPTER 2
Baseline of environmental and social condition

2. Baseline of environmental and social condition

The chapter incorporates the baseline data generated in the project site and secondary data collected from various Government and Semi-Governmental organizations. The details about the existing environmental values are presented in each section in the form of the maximum and minimum values at each location and indicating the duration of measurement. The area of the study covers 2 Km radius around the proposed site for flora and fauna assessment and 10 Km radius for the preparation of land use report.

The existing environmental setting is considered to adjudge the baseline conditions which are described with respect to ambient air quality, water quality, ambient noise level, flora and fauna.

An environmental baseline survey was conducted during the month of July 2020.

Methodology

The various environmental attributes were divided into primary and secondary studies. Primary attributes such as land environment, air environment, water, soil, biological environment were assessed by conducting field studies, on-site monitoring and secondary attributes such as land use studies, geology, hydrological characteristics, and socio-economic environment were assessed from literature review of previous studies and from various government publications. The primary filed studies and the collection of secondary attributes were completed.

The methodology for conducting the baseline environmental survey considered was as per the guidelines given in the Environmental Impact Assessment Guidance Manual for Building, Construction Projects (Give Proper Publication Name with Year). Baseline information with respect to air quality, noise level, water quality in the study area were collected by conducting primary sampling / field studies in July 2020.

Baseline status of the Biological environment was studied. The characteristics of study area with respect to the following environmental parameters were studied:

Primary Data Collection:

- Noise and Vibration Level
- Flora and Fauna
- Surface water quality
- Ambient air quality

Secondary Data Collection:

- **Social environment**
    - Settlement social structure
    - Economic activity

  - Social infrastructure and public facilities
  - Land acquisition/ Involuntary resettlement
  - Historical and cultural heritage
  - Health, sanitation and hazard
  - Gender
- **Natural Environment**
  - Topography
  - Geology
  - Hydrology
  - Climate

*I.*Primary Data Collection

2.1. Noise Environment

The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound, which is composed of many frequency components of various loudness, distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human to a complex sound made up of various frequencies at different loudness levels. The most common and universally accepted scale is the "A" weighted Scale which is measured as dB (A). This is more suitable for audible range of 20 to 20,000 Hz. The scale has been designed to weigh various components of noise according to the response of a human ear.

Noise monitoring has been undertaken for 24 hours at Southern side of Project Site near its Entrance. The main objective of noise monitoring in the study area was to establish the baseline noise levels and assess the impact of the total noise generated by the activities associated with construction.

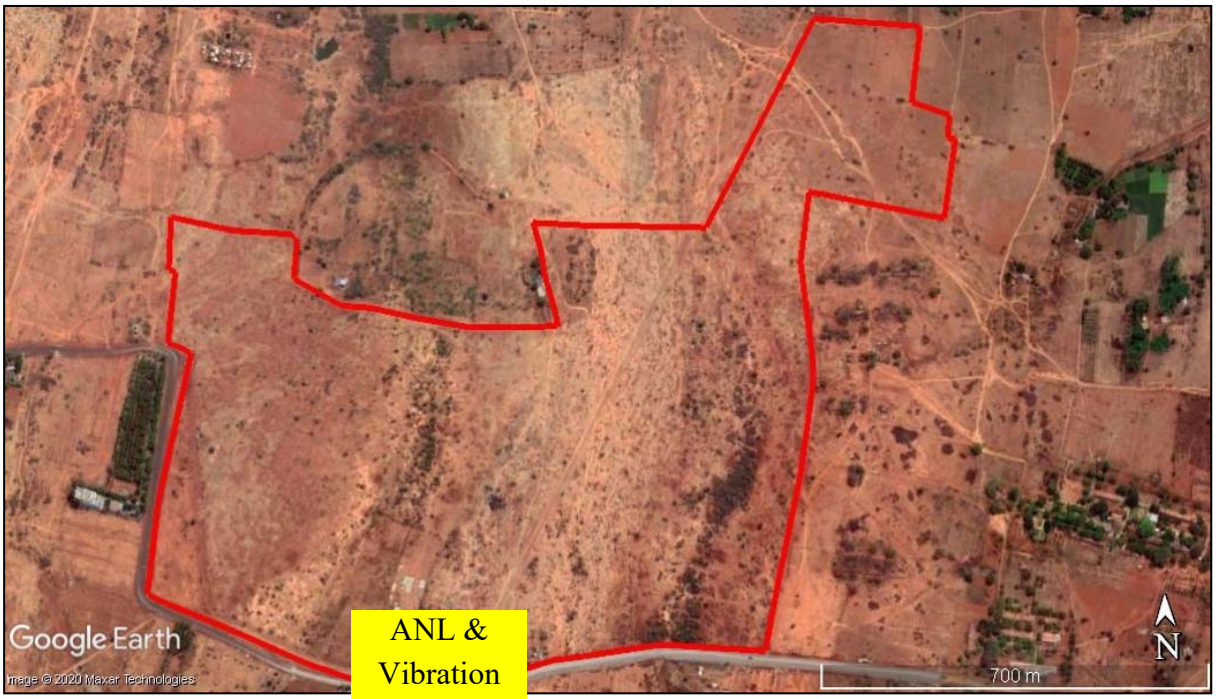


Figure 9 : Ambient Noise – Location of Sampling

Method of Monitoring

Using hand held instruments Sound Pressure Level (SPL) measurements and the levels were measured and recorded for 1 second at each hour and this was taken for 24 hours continuously. The day noise levels have been monitored during 6 am to 10 pm and night levels during 10 pm to 6 am at all the sampling locations covered in the study area.

Figure 10: Photographs of Sampling - Ambient Noise Level

Figure 11:Photographs of Sampling - Ambient Noise Level

Observations of Ambient Noise Levels

The noise levels in dB(A) Leq at various locations were observed to be in the range of 50.4 dB(A) to 53.1 dB(A). The noise levels were found within the permissible limits prescribed by NAAQ Standard. The Result of Analysis for the Ambient Noise Level is presented below.

Table 3: Ambient Noise Level – Hourly data

Time of monitoring (Hrs)	(NQ – 1) Result in dB(A) Leq
6.00-7.00	52.0
7.00-8.00	52.7
8.00-9.00	53.2
9.00-10.00	54.7
10.00-11.00	53.6
11.00-12.00	53.8
12.00-13.00	52.0
13.00-14.00	52.7
14.00-15.00	53.6
15.00-16.00	54.7
16.00-17.00	53.9
17.00-18.00	54.0
18.00-19.00	53.6
19.00-20.00	53.2
20.00-21.00	52.7
21.00-22.00	51.8
22.00-23.00	51.8
23.00-24.00	51.3
0.00-1.00	49.1
1.00-2.00	47.3
2.00-3.00	48.1
3.00-4.00	48.7
4.00-5.00	49.2
5.00-6.00	50.8
Day Lequivalent (06.00 – 20.00)	**53.1**
Night Lequivalent (20.00 – 06.00)	**50.4**

Table 4 : Ambient Noise Levels

Noise Level	Min.	Max.	Leq (dB)
Day	52.0	54.7	53.1
Night	47.3	52.7	50.4

2.2. Vibration

Machineries used for the construction will vibrate. The level of vibration is a useful indication of the machine's condition. Poor balance, misalignment &loose structures will cause the vibration levels to increase, and it is a sure sign that maintenance is needed.

Vibration instant reading was undertaken for 24 hours at the Southern side of Project Site near Entrance. The main objective of monitoring in the study area is to establish the baseline and assess the impact by the activities associated with construction. The existing site is vacant and far away from residential/commercial establishments. The selection of monitoring location was noted considering the movement of vehicles and minor activities within the project site.

Method of Monitoring

Using handheld instruments the levels were measured at all locations, recording for 1 second at each hour was taken for 24 hours continuously. The vibration is measured in terms of velocity (mm/s).

Table 5: Vibration Level in the project site

S. No.	Location	Units	Test Result	Test Method	Max. Acceptable Limit of ISO 2372& VDI 2056 Group G
01	Southern side of the project site (Sakthi Precast)	mm/s	1.9	Instruments Manual	1.81 to 4.5

2.3. Flora and Fauna

A rapid survey was done within the project site and outside the project site covering a distance of 2kms from the boundary of the site., This was done to evaluate the importance of the flora and fauna and the likely impacts once the project commences.

The methodology followed was a detailed literature survey followed by rapid biodiversity survey. The literature survey covered the following: , Project details, reports, maps, and other documents prepared if any and Secondary data from similar project reports and published articles/ literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents available from Government agencies and websites. The main

objective of the study is to provide necessary information on floristic structure of the project area. The tree species, shrubs, herbs, climbers and grasses were documented during the study period. Faunal survey covers the Terrestrial Fauna, Avian Fauna and Aquatic Fauna. The survey was based on visual observation, enquiry with local population and records available.

All the species observed were collected and identified with the help of local flora Gamble and Fischer 1915 - 1935; Matthew 1981 - 1983; Nair et al. 1983; Henry et al. 1989). For all plant species documented, the binominal and author citation have been checked with International Plant Name Index (IPNI). Flowering and fruiting phenology were monitored, and life forms were also categorized simultaneously according to their habitats. Based on the result of the survey, the documentation included identification of endangered and rare species as per Red Book.

Both direct and indirect observation methods were used to survey the fauna. Visual encounter method was employed to record vertebrate species. Additionally, survey of relevant literature was also done to consolidate the list of vertebrate fauna distributed in the area (Ali and Ripley 1983, Daniel 1983, Prater 1993, Murthy and Chandrasekhar1988). Point counts were adopted to record bird species in early morning and at evening. For point count, counts had been made within fixed time period using a pair of binoculars. Any birds presented within observable distance along the project site were recorded and identified. Identification was also made from bird calls. Since birds may be considered as indicators for monitoring and understanding human impacts on ecological systems. Based on the Wildlife Protection Act, 1972 species identified will be short-listed as Schedule II or I.

Butterflies surveys had been conducted during morning and daytime when these insects are active. Point count method was followed, counts had been made within fixed time period. Any butterflies observed along the project site were identified by naked eyes. A pair of binoculars had been used for assisting / species identification when necessary.

Figure 12: Biodiversity survey along project site (within the 2km radius)

Results

The survey was successful with regards to the objective. As the season was dry, it was evident that the late dry season time of the year within the study area when many of the residing fauna and flora are either dispersed (fauna), seasonal (flora) or dormant. Thus these specific limitations highlighted the necessity for a follow-up wet season survey for clear understanding of the biodiversity.

The habitat

The habitat type was largely limited to a single plain terrain large area on the South-west section of Madurai city. It consists of plain terrain and small boulders interspersed with grassy patches. Typical flora species recorded within this habitat type are given in Table 1 and shown in Figure. This habitat type is regarded as natural, but slightly disturbed due to grazing by livestock. No significant forest or vegetative cover were observed and is limited in the local landscape, medicinal plants were recorded but no major dependence from the local villages on these resources was observed. Although care was taken to cover the habitat during the study time, it could not bring out the full list of biodiversity as the seasonal changes are significant for such a habitat. Despite the limited time limits and due to the limited distribution in the landscape, this habitat is regarded as having very less sensitivity.

Flora

Results were quite interesting, a total of 103 species of flora were identified from the project site of which 10 tree species followed by 63 herbs, 19 shrubs and 11 climbers. The conservation status of all the identified species were analyzed of which climbers *Abrusprecatorius* and *Wattakakavolubilis* was identified as Near threatened and an herb

species *Melochiacorchorifolia* was identified as Endangered and all the rest were in the category of Not Evaluated (NE) or Lest Concern (LC)

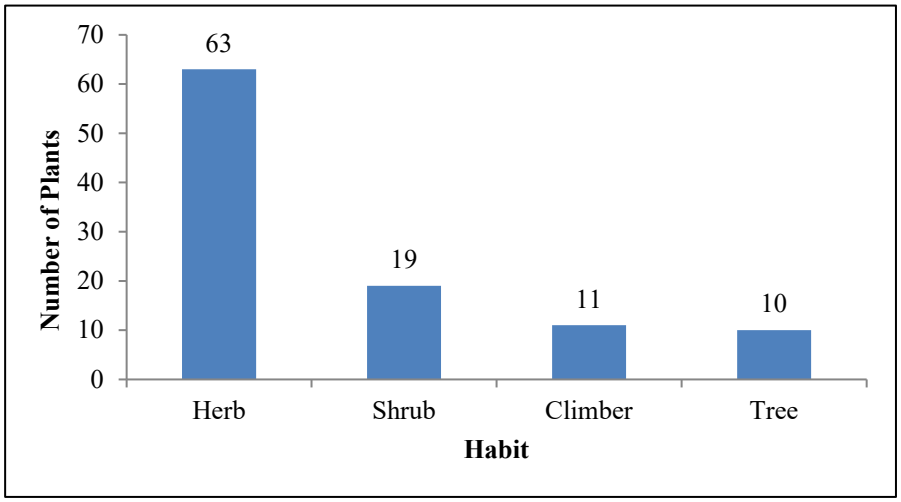


Figure 13 : Number of plants recorded in different habitats during floristic survey

Figure 14 : Sparse / scattered vegetative cover within the project site

Figure 15 : Sparse and fragmented vegetative cover outside the project site (within the 2km radius from the project site)

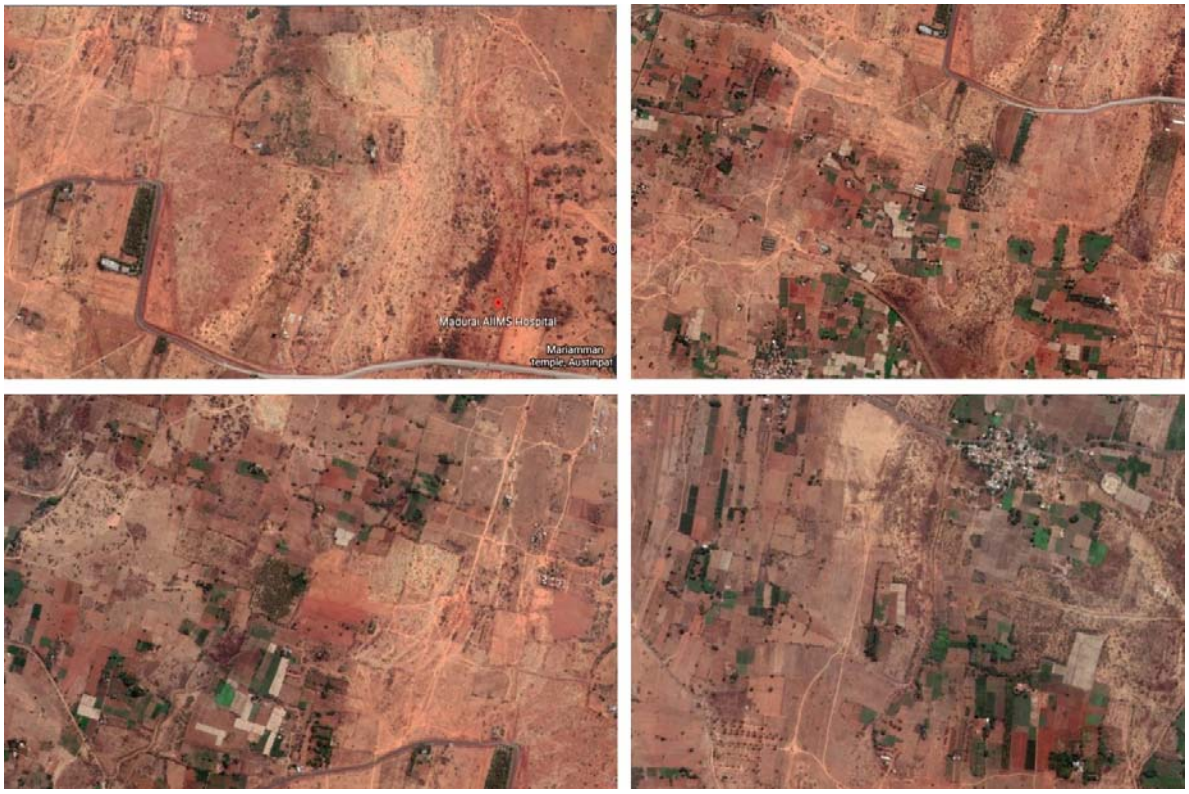
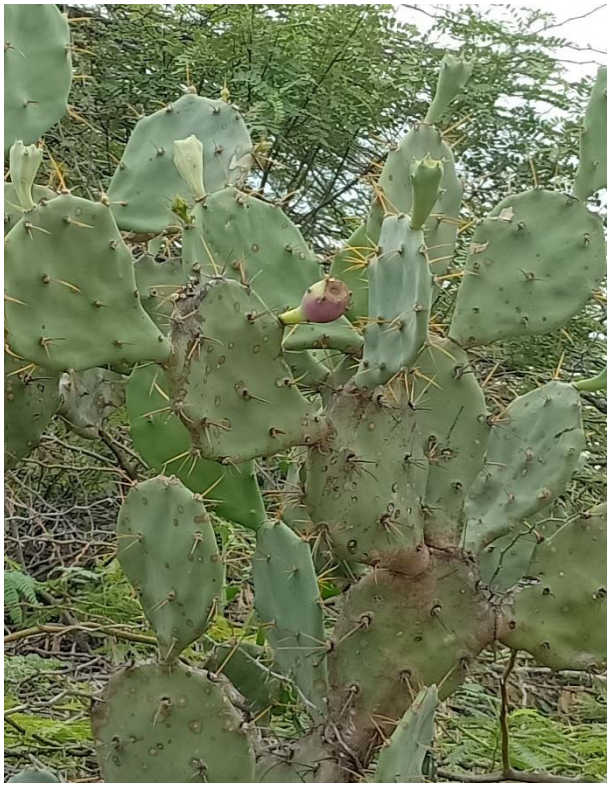


Figure 16 : Arial view of sparse and fragmented vegetative cover outside the project site (east, west, north and south directions images clockwise respectively within the 2km radius from the project site)

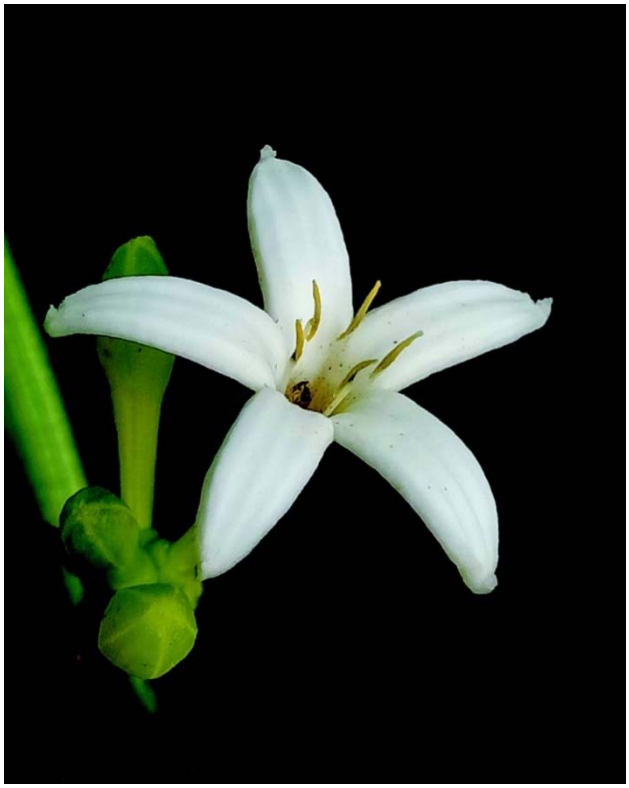
Figure 17 : View of landscape from the project site

Dichrostachys Cinerea

Delonix Regia



Morinda tinctoria



Opuntia dillenii

Hybanthus Enneaspermus

Physalis Angulata

Cleome viscosa

Passiflora foetida

Tephrosia purpurea

Tridax procumbens

Figure 18: Selective pictures of floral species identified from the study site

The scrubland

These habitats provide an excellent place for animals to survive during the usual environmental conditions and are a foraging place for small mammal species, which in turn form the basis for the tropical food chain. The study site comprises of a good percentage of the overall habitat, but these are extremely important breeding and foraging sites for small mammal species. Within the study area, this habitat represents the major habitat type followed by the agriculture fields. The grasses and groundcover in these habitats are not dense and don't have high forage value, this may change after the monsoon season as most of the ground cover are seasonal. Though the species diversity in this area was moderate to high, species from all trophic levels were not well represented and thus the overall diversity, connectivity and sensitivity of these areas were moderate.

Figure 19 : View of the grassland within site

Fauna

The field survey identified 20 bird species, 19 butterfly species, and 10 other fauna include amphibian, reptile and mammals

Birds: The different species of birds observed in the study area during the study period are given below and also enlisted in the Table given below. The common important birds species observed in the study area were Small Bee-eater, Indian Robin, Common Babbler, Common Myna and Indian Roller. The vegetation and the landscape supported very less number of birds, as the landscape was barren with fragmented and sparse vegetation. Birds identified were moving, passing through or residing at the project site for a short duration.

Butterflies are the important, and the most studied insect group in the world, they are good pollinators and indicators, butterflies extend their role as pests, predators and weed killers too. They belong to the order Lepidoptera, coming under the phylum Arthropoda and the class Insecta. There are about has 1,501 species of butterflies in India and the Western Ghats harbours around 330 species of butterflies. 19 species of butterflies were identified during the

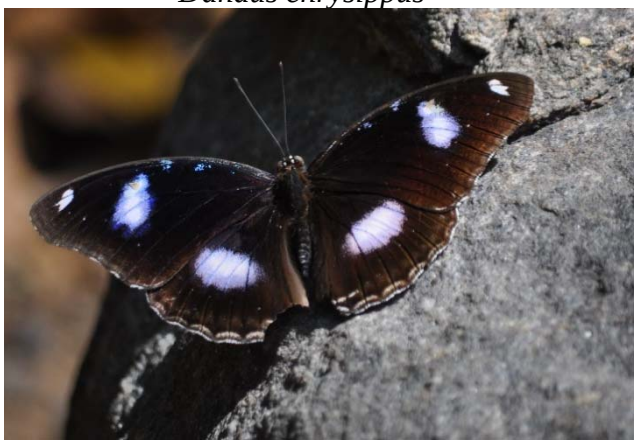
study period of which the Tawny Coster, Danaid Eggfly, Indian Cupid, Lemon Pansy, Lime Butterfly and Common Mormon were common and other species were spotted in few numbers and were of less frequency.

Other fauna like 2 species of amphibians, 5 mammal species and 3 species of reptiles were identified of which the garden lizard, Squirrel and Common goose were spotted more frequently.

Acraea terpsicore

Danaus chrysippus

Euploea core



Hypolimnas misippus

Figure 20 : View of butterflies from the study site

Table 6 : List of Floral species identified from the project site and their conservation status

S. No	Botanical Name	Local Name	Habit	Conservation Status
1	Abrusprecatorius	Kundumani	Climber	NT
2	Acacia nilotica	Nattukaruvel	Tree	LC
3	Acalyphaindica	Kuppaimeni	Herb	LC
4	Achyranthesaspera	Naayuruvi	Herb	NE
5	Aervalanata	Kurai poo	Herb	NE
6	Aloe vera	Katralai	Herb	LC
7	Alternantheraficoidea	Periyaponnankannikeerai	Herb	NE
8	Alternantherasessilis	Ponnankannikerai	Herb	LC
9	Alysicarpusbupleurifolius		Herb	LC
10	Amaranthusviridis	Kuppaikerai	Herb	LC
11	Andrographisechioides	Koburanthaangi	Herb	LC
12	Anisomelesmalabarica	Perunthumbai	Shrub	NE
13	Aristolochiaindica	Aaduthinnapalai	Climber	NE
14	Asparagus racemosus	Thannervittankizhangu	Climber	TE
15	Azadirachtaindica	Vembu	Tree	NE
16	Barleriacuspidata	Vwllaimulli	Shrub	NE
17	Barlerianoctiflora	Kurandi	Herb	NE
18	Bergiaammannioides	Nandukoluppuchedi	Herb	NE
19	Blumeaobliqua		Herb	NE
20	Boerhaviadiffusa	Saranathi	Herb	NE
21	Boerhaviaerecta	Mookarattai	Herb	NE
22	Calotropisgigantea	Erukku	Shrub	NE
23	Canthiumparviflorum	Kaarai	Shrub	NE
24	Capparissepiaria		Shrub	NE
25	Carissa spinarum	Kalakkaai	Shrub	NE
26	Carmona retusa		Tree	NE
27	Cassia auriculata	Aavarampu	Shrub	NE
28	Catunaregamspinosa	Kattunaranum	Shrub	NE
29	Cissusquadrangularis	Pirandai	Climber	NE
30	Cleome aspera	Naaikaduku	Herb	NE
31	Cleome feline	Ariyavelai	Herb	NE
32	Cleome viscosa	Naaikaduku	Herb	NE
33	Cocciniagrandis	Kovaikaai	Climber	NE
34	Coldeniaprocumbens	Seruppadai	Herb	NE
35	Corbichoniadecumbens	Milakusaranai	Herb	NE
36	Corchorusaestuans	Pinnakupoondu	Shrub	NE

37	Croton bonplandianus	Rail poondu	Herb	NE
38	Cyanotis		Herb	NE
39	Cynodandactylon	Arugampull	Herb	NE
40	Cyperusrotundus	Korai pull	Herb	LC
41	Daturametel	Oomathai	Herb	NE
42	Delonixregia	Senkondrai	Tree	NE
43	Desmodiumheterophyllum	Chirupulladi	Herb	LC
44	Dichrostachyscinere	Vidathalai	Tree	NE
45	Dregeavolubilis	Perunkurijankeerai	Climber	NE
46	Dyschoristemadurensis		Herb	NE
47	Echinochloa	Pull	Herb	LC
48	Ecliptaprostrata	Karisalankanni	Herb	LC
49	Eleocharis	Korai pull	Herb	NE
50	Enicostemaaxillare	Vellaruku	Herb	NE
51	Eragrostis	Narivaal pull	Herb	NE
52	Euphorbia antiquorum	Kalli	Shrub	NE
53	Euphorbia hirta	Amman pacharisi	Herb	NE
54	Euphorbia prostrata	Sithiraipaladai	Herb	NE
55	Evolvulusalsinoides	visnukiranthi	Herb	LC
56	Gmelinaasiatica	Nilakumil	Shrub	NE
57	Gomphrenaserrata	Vellaivadamalli	Herb	NE
58	Heliotropiumscabrum	AnaiKundumani	Herb	NE
59	Holopteleaintergrfolia	Aavimaram	Tree	NE
60	Hybanthusenneaspermus	Oorithalthaamarai	Herb	NE
61	Indigoferaaspalathoides	Sivanarvembu	Herb	NE
62	Indigoferaenneaphylla	Seppunerunchi	Herb	NE
63	Jasminumangustifolium	Kattumalli	Climber	NE
64	Jatrophagossypifolia	Sivappuaathalai	Shrub	NE
65	Jatrophaglandulifera	Vellaiaathalai	Shrub	NE
66	Kyllinganemoralis	veluttanirbasi	Herb	LC
67	Lepidagathispungens	Perunkorandi	Herb	NE
68	Melochiacorchorifolia	Pinnakupoodu	Herb	E
69	Merremiaemarginata	Elikathuelai	Herb	NE
70	Merremiatridentata	Muthiyarkunthal	Herb	NE
71	Morindatinctoria	Nuna	Tree	LC
72	Mullugoverticillata	Parpadakam	Herb	NE
73	Ocimum sanctum	Thulasi	Herb	NE
74	Oldenlandiaumbellata	Impural	Herb	NE
75	Opuntiadillenii	Sappathikalli	Shrub	NE
76	Orthosiphonaristatus	Punaimeesaithulasi	Herb	LC

77	Passiflorafoetida	Anilpalam	Climber	NE
78	Pavoniaodorata	Peramutti	Shrub	NE
79	Pergulariadaemia	veliparuthi	Climber	NE
80	Perotisindica	Punaivaalpull	Herb	NE
81	Phyllanthusamarus	Keelanelli	Herb	NE
82	Phyllanthusmaderaspatensis	Melanelli	Herb	NE
83	Phyllanthusvirgatus	Periyakeelanelli	Herb	NE
84	Physalisangulata	Sodakkuthakkali	Herb	LC
85	Polycarpaeacorymbosa	Nilasadachi	Herb	NE
86	Polygala arvensis	Milakunangai	Herb	NE
87	Portulacaoleracea	Paruppukeerai	Herb	NE
88	Prosopisjuliflora	Karuvelam	Tree	NE
89	Riveahypocrateriformis	Musuttai	Climber	NE
90	Senna angustifolia	Aavarai	Shrub	NE
91	Senna uniflora		Herb	NE
92	Sidaacuta	Arivalmanaipoondu	Shrub	NE
93	Sidacordifolia	Nilathuthi	Shrub	NE
94	Spermacocehispida	Nathaisoori	Herb	NE
95	Tephrosiapurpurea	Kolunchi	Herb	NE
96	Trianthematriquetrum	Saranathi	Herb	NE
97	Tribulusterrestris	Nerinchil	Herb	LC
98	Tridaxprocumbens	Vettukayapundu	Herb	NE
99	Vachellialeucophloea	Velvel	Tree	NE
100	Vernoniacinerea	Neichitti	Herb	LC
101	Waltheriaindica	Shengalipoondu	Shrub	NE
102	Wattakakavolubilis	Kodipalai	Climber	NT
103	Ziziphusjujuba	Elanthai	Tree	LC

Not Evaluated (NE) Least Concern (LC) Near Threatened (NT) Endangered (E)

Table 7: List of Birds identified from the project site and their conservation status

S. No	Scientific Name	Local Name	Conservation Status
1	Bubulcus ibis	Cattle Egret	LC
2	Accipiter badius	Shikra	LC
3	Columba livia	Blue Rock Pigeon	LC
4	Streptopeliachinensis	Spotted Dove	LC
5	Halcyon smyrnensis	White-breasted Kingfisher	LC
6	Meropsorientalis	Small Bee-eater	LC
7	Pycnonotuscafer	Red-vented Bulbul	LC
8	Saxicoloidesfulicata	Indian Robin	LC

9	Coraciasbenghalensis	Indian Roller	LC
10	Upupaepops	Common Hoopoe	LC
11	Dinopiumjavanense	Common Golden-backed Woodpecker	LC
12	Anthusrufulus	Paddyfield Pipit	LC
13	Turdoidescaudatus	Common Babbler	LC
14	Nectarinia minima	Small Sunbird	LC
15	Acridotherestristis	Common Myna	LC
16	Vanellusindicus	Red-wattled Lapwing	
17	Dicrurusmacrocercus	Black Drongo	LC
18	Lonchurapunctulata	Spotted Munia	LC
19	Dendrocittavagabunda	Indian Treepie	LC
20	Corvussplendens	House Crow	LC

Not Evaluated (NE) Least Concern (LC) Near Threatened (NT) Endangered (E)

Table 8 :List of major fauna identified from the project site and their conservation status

S. No	Scientific Name	Local Name	Status
1	Ranahexadactyla	Frog	LC
2	Ranatigrina	Bullfrog	LC
3	Lepusnigricollis	Hare	LC
4	Funabuluspalmarum	Squirrel	LC
5	Rattusnorvegicus	Fieldmouse	LC
6	Herpestesedwardii	Commonmongoose	LC
7	Bandicotaindica	Bandicoot	LC
8	Rtyasmucosus	Rat snake	LC
9	Dendrelaphistristis	Bronze-back tree snake	LC
10	Calotesversicolor	Garden lizard	LC

Not Evaluated (NE) Least Concern (LC) Near Threatened (NT) Endangered (E)

Table 9 : List of Butterflies identified from the project site and their conservation status

S. No	Scientific Name	Local Name	Status
1	Danaus genutia	Striped Tiger	LC
2	Danaus chrysippuschrysippus	Plain Tiger	LC
3	Euploea core	Common Crow	LC
4	Acraea terpsicore	Tawny Coster	LC
5	Melanitisledaleda	Common Evening Brown	LC
6	Jamidescelenoceleno	Common Cerulean	LC
7	Evereslacturnus	Indian Cupid	LC
8	Papiliopolytespolytes	Common Mormon	LC

9	Papiliopolytesromulus	Common Mormon	LC
10	Pachlioptaaristolochiae	Common Rose	LC
11	Papiliodemoleusdemoleus	Lime Butterfly	LC
12	Hypolimnasmisippus	DanaidEggfly	LC
13	Junoniaalmana	Peacock Pansy	LC
14	Junoniahierta	Yellow Pansy	LC
15	Junonialemonias	Lemon Pansy	LC
16	Hypolimnasbolina	Great Egg Fly	
17	Hypolimnasmisippus	DanaidEggfly	LC
18	Phalantaphalantha	Common Leopard	LC
19	Zizulahylax	Tiny Grass Blue	LC
20	Catochrysopsstrabo	Forget-Me-Not	LC
18	Euchrysopscnejus	Gram Blue	LC
19	Lampidesboeticus	Pea Blue	LC

Not Evaluated (NE) Least Concern (LC) Near Threatened (NT) Endangered (E)

Terrestrial Ecosystem

103 species of flora were identified from the project site of which there were 10 tree species followed by 63 herbs, 19 shrubs and 11 climbers, 19 species of butterflies, 20 species of birds and 2 species of amphibians, 5 mammal species and 3 species of reptiles. Of the 103 floral species identified nearly 100 species are Not Evaluated of Least Concern, 2 species are in the category of Near Threatened and 1 species in the category of Endangered. The very low density of this ecosystem and sparse distribution will minimize the impact on this aspect.

Wetland Ecosystem

No water body or wetland exist in or along the project site, temporary wetlands can be witnessed during the monsoon and post monsoon seasons. The existing floral diversity also does not indicate the presence of any permanent wetland in the site.

2.4. Water Environment

Assessment of water quality in the study area was done to assess the parameters as per the standards for discharge of trade effluent into Inland Surface waters. One water sample from the open wells which lies in the south eastern side of project was collected for assessment of the physicochemical quality.

Sampling and Analysis

Water sampling has been done to determine the existing quality of ground and surface water around the project area and to assess the impact from the proposed project. Sampling has been done by following standard guidelines for physical, chemical and bacteriological parameters. Analysis has been carried out by following methods prescribed in “Standard Methods for the Examination of Water and Wastewater (21st Edition- include year)”. Sample

was collected from the open well located within the project site. The site selection was done taking into account the drainage pattern and locations prone to water contamination. The satellite image showing the location of sampling is presented in the following figure.

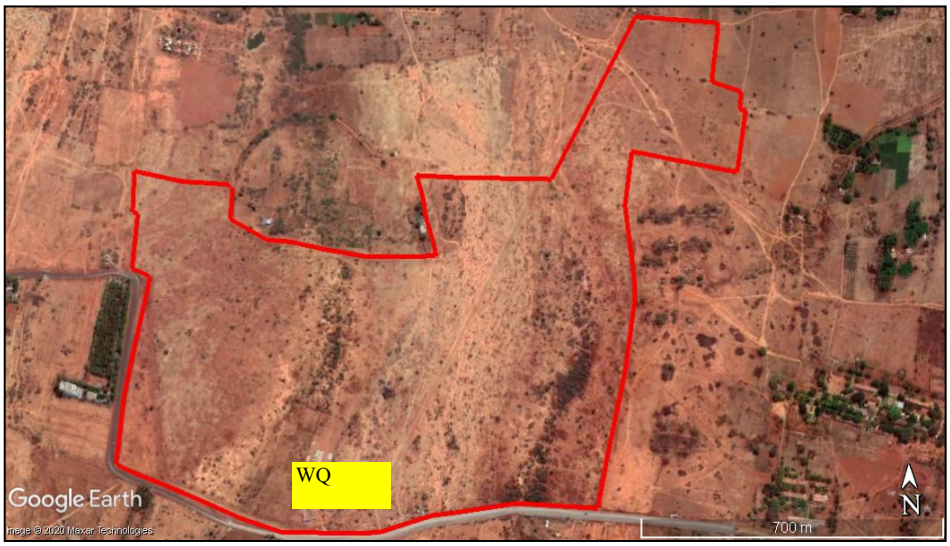


Figure 21 Water Quality – Location of Sampling

Figure 22 :Water sampling from the Open well

Presentation of Results

The water sample concentrations can be attributed to natural factors and does not indicate that water quality has been compromised by any development activities in surrounding areas. The hardness and total dissolved solids in the water sample exceeds the limits prescribed for drinking purposed which indicates the presence of salts. However, there are no identifications of heavy metals or any other harmful parameters. Thus, parameters of the water quality are within the standards for discharge of trade effluent into Inland surface water. The detailed Result of Analysis for the water sample is given below.

Table 10: Result of Analysis – Water Quality (Open Well)

S. No.	Parameter	Units	Method	Result	Tolerance limits for discharge of trade effluent into Inland Surface Water
1	Colour in Hazen	Hazen	IS: 3025 Part: 04	< 1.0	-
2	Turbidity in NTU	NTU	IS 3025 Part: 10	< 0.5	-
3	pH @ 25ºC	--	IS 3025 Part: 11	7.0	5.5 to 9.0
4	Total Hardness as $CaCO_3$	mg/L	IS 3025 Part: 21	271	-
5	Calcium as Ca	mg/L	IS 3025 Part: 40	83	-
6	Magnesium as Mg	mg/L	IS 3025 Part: 46	27	-
7	Chloride as Cl	mg/L	IS 3025 Part: 32	357	1000
8	Sulphate as SO_4	mg/L	IS 3025 Part: 24	114	1000
9	Iron as Fe	mg/L	IS 3025 Part: 53	BDL (DL= 0.01)	-
10	Free Residual Chlorine	mg/L	IS 3025 Part: 26	<0.1	1.0
11	Copper as Cu	mg/L	IS 3025 Part: 42	BDL (DL= 0.01)	3.0
12	Manganese as Mn	mg/L	IS 3025 Part: 59	< 0.03	-
13	Nitrate as NO_3	mg/L	IS 3025 Part: 34	BDL (DL= 1.0)	-
14	Fluoride as F	mg/L	IS 3025 Part: 60	< 0.1	2.0
15	Phenolic Compound as C_6H_5OH	mg/L	IS 3025 Part: 43	<0.001	1.0
16	Cyanide as CN	mg/L	IS 3025 Part: 27	<0.02	0.2
17	Lead as Pb	mg/L	IS 3025 Part: 47	BDL (DL= 0.01)	0.1
18	Zinc as Zn	mg/L	IS 3025 Part: 49	BDL (DL= 0.01)	1.0
19	Anionic Detergents as MBAS	mg/L	IS 13428 (Annex K)	<0.01	-
20	Mercury as Hg	mg/L	IS 3025 Part: 48	BDL (DL= 0.001)	0.01
21	Cadmium as Cd	mg/L	IS 3025 Part: 40	BDL (DL= 0.001)	2.0
22	Selenium as Se	mg/L	IS 3025 Part: 56	BDL (DL= 0.01)	0.05
23	Arsenic as As	mg/L	IS 3025 Part: 37	BDL (DL= 0.01)	0.2
24	Aluminium as Al	mg/L	IS 3025 Part: 55	BDL (DL= 0.02)	-
25	Boron as B	mg/L	IS 3025 Part: 57	<0.2	2.0
26	Hexavalent Chromium as Cr6+	mg/L	IS 3025 Part: 52	<0.01	0.1

27	Mineral Oil	mg/L	IS 3025 Part: 39	BDL (DL= 0.5)	-
28	Odor	--	IS 3025 Part: 05	Agreeable	-
29	Taste	--	IS 3025 Part: 08	Agreeable	-
30	Total Alkalinity as CaCO3	mg/L	IS 3025 Part: 23	195	-
31	Total Dissolved Solids @ 105ºC	mg/L	IS 3025 Part: 16	962	2100
32	Escherichiacoli (MPN)	MPN / 100ml	IS 1622	<2.0	-
33	Total Coliform (MPN)	MPN / 100ml	IS 1622	<2.0	-
34	Bio chemical oxygen demand (BOD @ 27ºC for 3days)	mg/L	IS 3025 Part: 44	< 1.0	30
35	Chemical Oxygen Demand (COD)	mg/L	IS 3025 Part: 58	< 1.0	250
36	Dissolved Oxygen	mg/L	IS 3025 Part: 38	6.0	-
37	Electrical Conductivity (EC) @ 25ºC	µmhos/cm *	IS 3025 Part: 14	1480	-
38	Oil & Grease	mg/L	IS 3025 Part: 39	< 1.0	10
39	Total Kjeldahl Nitrogen (as N)	mg/L	APHA 23rd 4500Norg C	< 0.7	100
40	Total Phosphorus (as P)	mg/L	APHA 21st Edi 4500 P-D	< 0.2	-

BDL: Below Detection Limit; DL: Detection Limit,

* Note: 1 µmho/cm = 0.1 mS/m = 1 µS/cm

2.5. Air Environment

The ambient air monitoring locations have been selected based on the meteorological data obtained from Regional Meteorological Centre (RMC), Madurai. This will give a good indication of the baseline Air Quality of the existing site.

Sampling Location

For the purpose of the study, sampling location at Southern side of Project Site (Near Entrance) was selected to assess the baseline environmental quality with respect to the air environment. The sampling frequency was 4 samples for 24 hours at the sample location.

The sample location shown in the satellite image is given below:

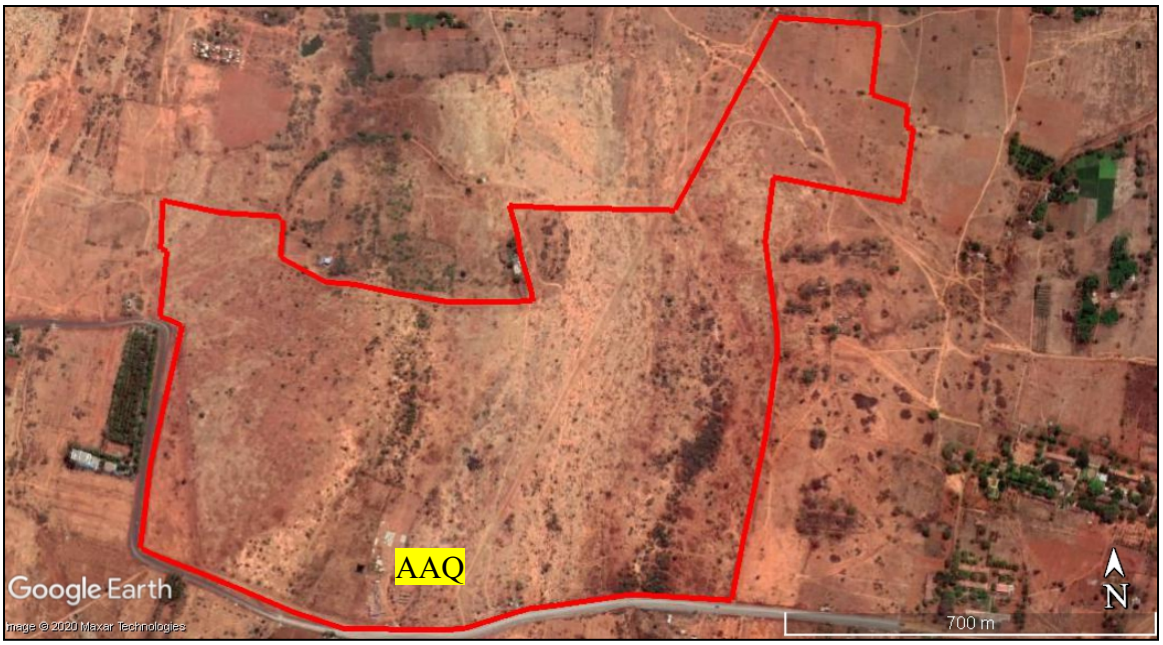


Figure 23: Ambient Air Quality – Location of Sampling

The photographs showing the collection of samples is given below:

Figure 24: Photographs of Sampling - Ambient Air Quality

Figure 25: Photographs of Sampling - Ambient Air Quality

Parameter

The baseline data of air environment is covered for the following parameters:

- PM_{10}
- $PM_{2.5}$
- Sulphur dioxide (SO_2)
- Oxides of Nitrogen (NO_X)
- Carbon Monoxide (CO)

The sampling duration for PM_{10}, $PM_{2.5}$, SOx and NOx is for twenty four hours average and three eight hours sampling and CO is recorded for hourly samples. Good Laboratory Practices was followed in Sample preservation and transportation as per developed in-house checklist

Method of Analysis

The air samples are analyzed as per standard methods specified by Central Pollution Control Board (CPCB) and IS-5182.PM_{10}, $PM_{2.5}$ present in ambient air are sucked through the cyclone. Coarse and non-respirable dust is separated from the air stream by centrifugal forces acting on the solid particles. These separated particulates fall through the cyclone's conical hopper and gets collected in the sampling cap placed at the bottom. The fine dust ($PM_{2.5}$ Microns) forming the respirable fraction of the PM_{10} passes the cyclone and is retained by the filter paper. A tapping is provided on the suction side of the blower to provide suction for sampling air through a set of impinges. Samples of gases are drawn at a flow rate of 0.2 liters per minute (Lpm).

PM_{10} and $PM_{2.5}$ have been estimated by gravimetric method. Modified West and Gaeke method (IS-5182 Part-II, 2001, Reaff: 2012) has been adopted for estimation of SO_2. Jacobs-Hochheiser method (IS-5182 Part-IV, 2006, Reaff: 2012) has been adopted for the estimation of NO_X. The CO levels were analyzed with the handheld CO meter.

Presentation of Data

Ambient Air Quality - Results of Monitoring and Analysis

During the period of monitoring at the ambient air quality monitoring site, no objectionable odors were detected by Field personnel. The result of analysis for the ambient air quality is given below:

Table 11 : Result of Analysis – Ambient Air Quality

Location Name	Date of Sampling	Range	Parameters				
			PM10 µg/m³	PM2.5 µg/m³	SO2 µg/m³	NOx µg/m³	CO mg/m³
Project site	23.07.2020	Min	64.4	32.7	9.1	17.2	BDL(DL:1.14)
	25.07.2020	Max	69.4	34.1	9.7	18.5	BDL(DL:1.14)
	27.07.2020	Mean	67.1	33.4	9.5	17.9	BDL(DL:1.14)
	29.07.2020	**98%**	**69.3**	**34.0**	**9.6**	**18.4**	**BDL(DL:1.14)**
NAAQ Standards			**100**	**60**	**80**	**80**	**2**

Based on the results of the baseline ambient air quality monitoring conducted and review of ambient air quality data from air quality monitoring stations in studies of nearby regions, air quality in the site is representative of that found in a rural area. The site location has the CO Concentration which is below the detectable limits. The parameters are within the NAAQ standards.

II. Secondary Data:

1. Social Environment

2.6 Settlement social structure

The administrative unit within the study area (10 km radius) from the project boundary comprises of 92 Villages and 150habitations (both urban and rural) covering parts of the study area in Konalpudupatti Village, Madurai South Taluk, Madurai District of Tamil Nadu.

The study area (10 km Radius from the project site boundary) lies in between N. Latitudes 09°48’00” and 09°58’30” and E. Longitude 77°54’00” and 78°06’00” and forms part of the Survey of India Toposheet Nos. 58-G/13, 58-K/01.

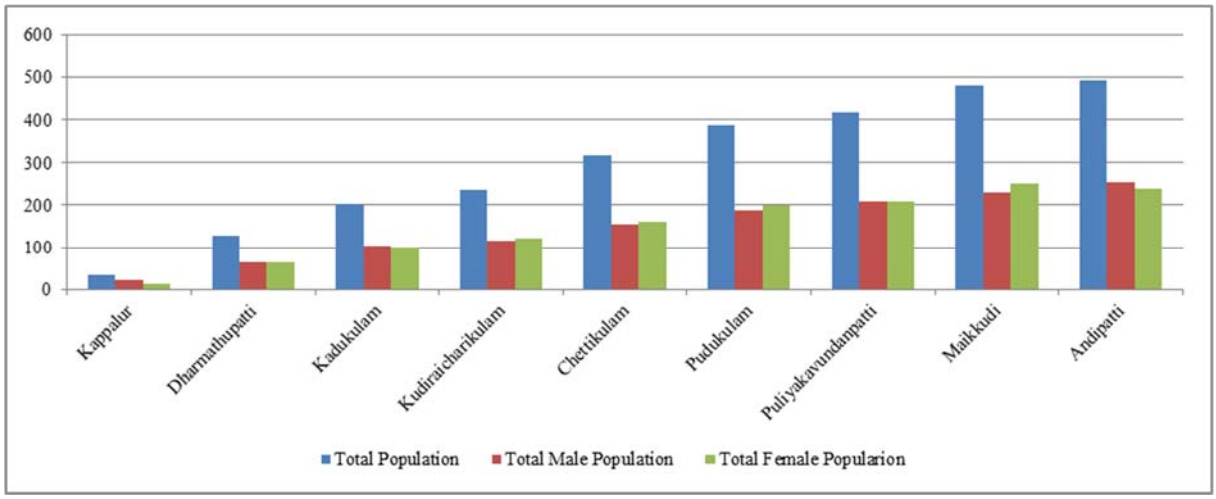


Figure 26: List of Villages in 10 km radius having population less than 1,000

The project site falls in both in 58-G/13, 58-K/01. The total aerial extent of the study area covering 10km radius from the project site boundary is 359Sq.km.

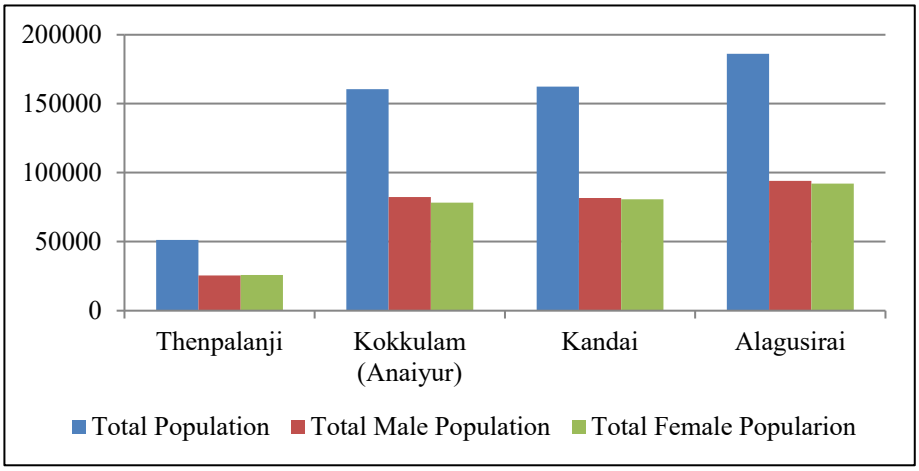


Figure 27 : List of Villages in 10 km radius having population greater than 50,000 and less than 2,00,000

Table 12 : Census data for the villages in 10 km radius

Name	TRU*	No_HH*	TOT_P*	TOT_M*	TOT_F*	P_06*	M_06*	F_06*	P_SC*	M_SC*	F_SC*	P_ST*	M_ST*	F_ST*
Tattanur	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
Vannankulam	Rural	0	0	0	0	0	0	0	0	0	0	0	0	0
Kappalur	Rural	8	33	21	12	3	2	1	0	0	0	0	0	0
Dharmathupatti	Rural	33	128	64	64	6	4	2	0	0	0	0	0	0
Kadukulam	Rural	48	203	104	99	18	9	9	104	54	50	0	0	0
Kudiraicharikulam	Rural	68	236	116	120	17	6	11	50	24	26	0	0	0
Chettikulam	Rural	83	317	155	162	29	12	17	91	45	46	0	0	0
Pudukulam	Rural	95	387	188	199	53	28	25	72	28	44	0	0	0
Puliyakavundanpatti	Rural	100	418	209	209	47	30	17	37	17	20	0	0	0
Maikkudi	Rural	132	481	231	250	43	22	21	279	143	136	0	0	0
Andipatti	Rural	128	493	254	239	44	27	17	258	131	127	0	0	0
Perungudi	Rural	131	538	285	253	71	38	33	85	52	33	0	0	0
Tirali	Rural	162	674	356	318	68	32	36	212	118	94	0	0	0
JosyarAlangulam	Rural	173	689	356	333	57	35	22	222	118	104	0	0	0
K.Puliyankulam	Rural	185	799	391	408	89	46	43	199	96	103	0	0	0
Sathangudi	Rural	227	860	423	437	96	44	52	58	29	29	0	0	0
S.Puliankulam	Rural	262	954	488	466	81	44	37	58	28	30	0	0	0
Chockanathanpatti	Rural	228	962	479	483	115	58	57	637	328	309	0	0	0
Sambakudi	Rural	256	969	488	481	83	46	37	224	118	106	0	0	0
sakkilipatti	Rural	262	1019	531	488	106	52	54	89	38	51	0	0	0
Virusankulam	Rural	259	1022	522	500	163	77	86	264	131	133	0	0	0
Achampattu	Rural	301	1107	557	550	105	48	57	36	18	18	0	0	0
Vedarpuliankulam	Rural	339	1282	656	626	176	95	81	0	0	0	0	0	0
Palakkapudupatti	Rural	362	1317	654	663	131	67	64	635	313	322	0	0	0
Kinnimangalam	Rural	347	1347	693	654	166	89	77	562	286	276	0	0	0
Soorakkulam	Rural	345	1382	701	681	177	83	94	430	219	211	0	0	0
Thuvariman	Rural	389	1435	692	743	136	66	70	118	53	65	4	3	1
Karisalpatti	Rural	364	1525	794	731	179	92	87	0	0	0	0	0	0
Erramalampatti	Rural	375	1542	758	784	186	93	93	376	183	193	8	3	5
Vadapalanji	Rural	431	1543	759	784	166	80	86	254	124	130	0	0	0
Kilakuyilkudi	Rural	451	1677	860	817	149	74	75	667	339	328	0	0	0
Thottiyapatti	Rural	444	1712	865	847	189	104	85	795	412	383	0	0	0
Othaialangulam	Rural	528	2257	1154	1103	261	147	114	787	370	417	0	0	0
Valanendal	Rural	631	2435	1272	1163	333	176	157	173	90	83	0	0	0
Ponnamangalam	Rural	641	2477	1279	1198	275	146	129	71	32	39	0	0	0
Kannanur	Rural	648	2569	1283	1286	283	147	136	299	147	152	0	0	0
Urappanur	Rural	697	2606	1349	1257	289	164	125	410	204	206	0	0	0
Vadivelkarai	Rural	703	2639	1309	1330	292	144	148	406	198	208	24	13	11
Thirumangalam (M)	Rural	724	2784	1406	1378	263	143	120	608	296	312	1	1	0
Uchapatti	Rural	824	3085	1547	1538	319	157	162	487	233	254	0	0	0

Name	TRU*	No_HH*	TOT_P*	TOT_M*	TOT_F*	P_06*	M_06*	F_06*	P_SC*	M_SC*	F_SC*	P_ST*	M_ST*	F_ST*
Pungankulam	Rural	1026	3848	1913	1935	421	199	222	315	152	163	0	0	0
PeriyaAlangulam	Rural	1314	4644	2362	2282	424	232	192	877	441	436	0	0	0
Thoppur	Rural	1262	4962	2507	2455	575	302	273	453	226	227	1366	688	678
Erkudi	Rural	1259	4970	2517	2453	549	282	267	789	393	396	1	0	1
Valayapatti	Rural	1514	5705	2869	2836	792	419	373	480	250	230	0	0	0
Vagaikulam	Rural	2397	9081	4554	4527	1104	532	572	1824	885	939	4	2	2
Melakuyilkudi	Rural	2912	10698	5514	5184	1186	637	549	1539	786	753	0	0	0

(Source: Census Data 2011 published by Census of India)

Note: *

TRU	T - Total, R - Rural, U - Urban
No_HH	Number of Households
TOT_P	Total Population
TOT_M	Total Males
TOT_F	Total Females
P_06	Population in the Age group 0-6
M_06	Male Population in the Age group 0-6
F_06	Female Population in the Age group 0-6
P_SC	Population Scheduled Caste
M_SC	Male Population Scheduled Caste
F_SC	Female Population Scheduled Caste
P_ST	Population Scheduled Tribe
M_ST	Male Population Scheduled Tribe
F_ST	Female Population Scheduled Tribe

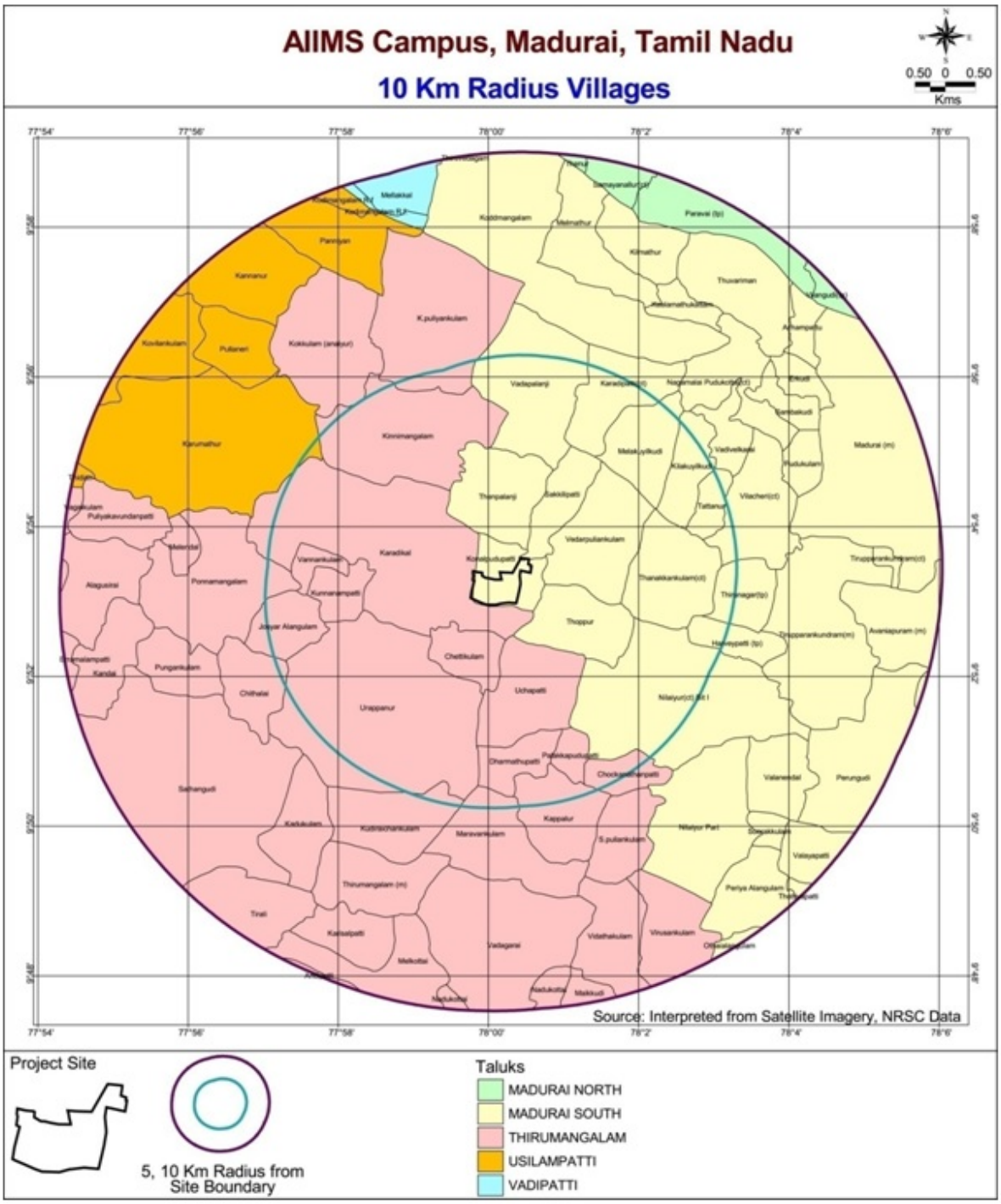


Figure 28 : Map of villages in 10 km radius

2.6.1 Land use Pattern

To demarcate different land use classes, the remote sensing data such as satellite imagery was used and then GIS techniques are applied for assessing the areal extent of the different classes. Final interpretation was carried out for the 10 km radius from the proposed construction project site in AIIMS Campus, Madurai District, Tamil Nadu State.

The site is in the cardinal direction North of South West of Madurai Town. The site selected is in a flat terrain. The study area (10 Km Radius from the project site boundary) lies in between N. Latitudes 09°48'00" and 09°58'30" and E. Longitude 77°54'00" and 78°06'00" and as stated earlier 10 km radius forms part of the Survey of India Toposheet Nos. 58-G/13, 58-K/01.

As per the EIA guidelines the study area has been divided into Core zone and Buffer zone which is about 10 km radius from the boundary of the proposed project site area. The current land use has to be assessed as it forms the basis for any developmental planning.

Objectives of Land Use / Land Cover map

Land Use / Land Cover - Land Use refers to man's activity and the various uses, which are carried on land. Land Cover refers to natural vegetation, water bodies, rock/soil, artificial cover and others, resulting due to land transformation. The main objective of the study is to classify the different land use within 10 km from the project boundary.

Methodology

Information of land use and land cover is important for many planning and management activities concerning the surface of the earth (Agarwal and Garg, 2000). Land use refers to man's activities on land, which are directly related to land (Anderson et al., 1976). The land use and the land cover determine the infiltration capacity. Barren surfaces are poor retainers of water as compared to grasslands and forests, which not only hold water for longer periods on the surface, but at the same time allow it to percolate down.

The terms ' land use' and 'land cover' (LULC) are often used to describe maps that provide information about the types of features found on the earth's surface (land cover) and the human activity that is associated with them (land use). Satellite remote sensing is being used for determining different types of land use classes as it provides a means of assessing a large area with limited time and resources. However, satellite images do not record land cover details directly and they are measured based on the solar energy reflected from each area on the land. The amount of multi spectral energy in multi wavelengths depends on the type of material at the earth's surface and the objective is to associate particular land cover with each of these reflected energies, which is achieved using either visual or digital interpretation. In the present study the task is to study in detail the land use and land cover in and around the project site. The study envisages different LULC around the proposed project area and the procedure adopted is as below

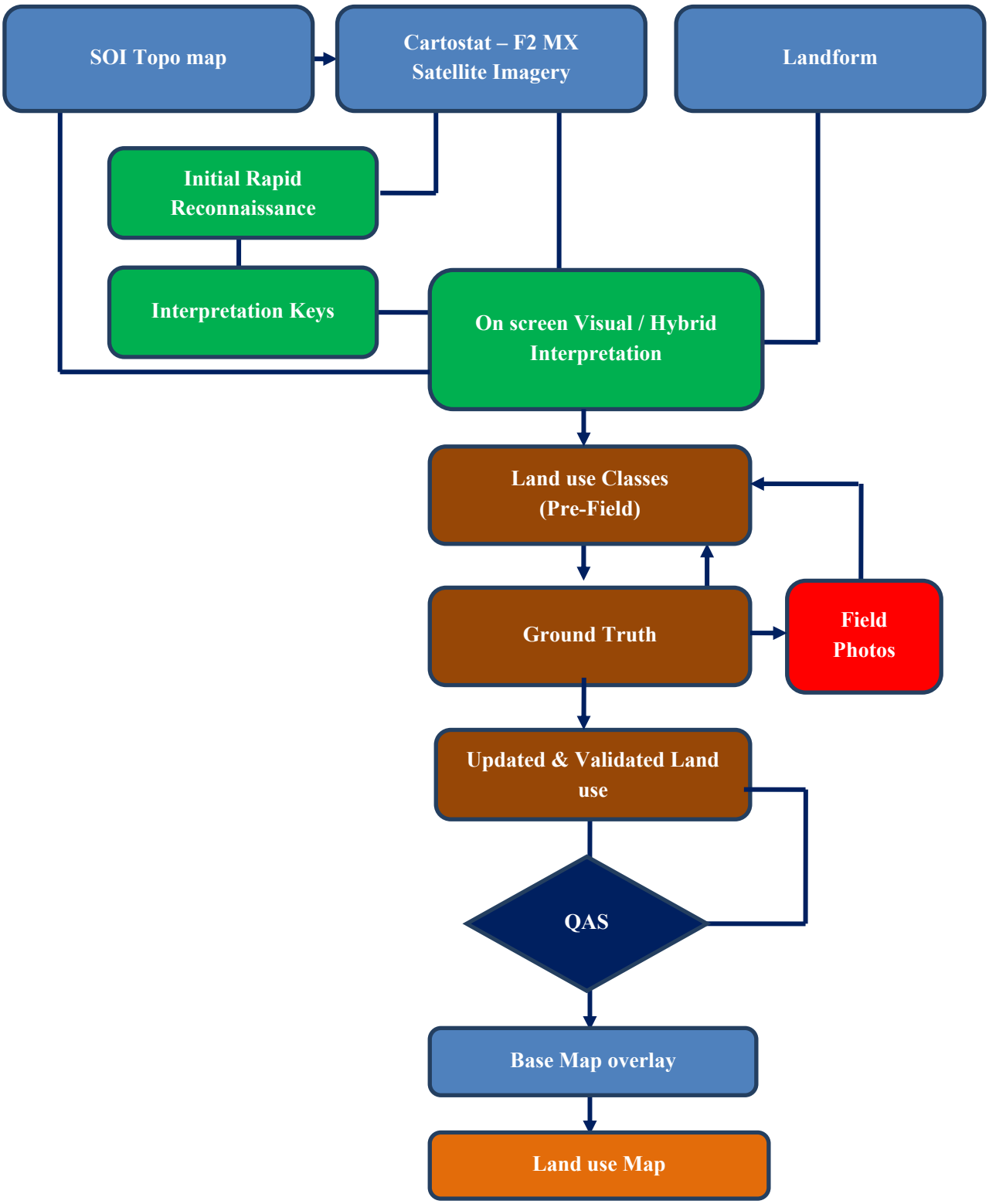


Figure 29:Flow Chart showing Methodology of Land use mapping

Satellite Data

IRS Catrostat- F2-MX satellite data of 05th March 2019 was utilized for the present study. Details of satellite data is given below. The rectification of imagery was carried out to bring the digital data on the earth coordinate system by means of ground control point (GCP) assignments/SOI toposheets.

Scale of mapping

Considering the user defined scale of mapping, 1:50000 IRS-P6, LISS-III data on 1:50000 Scale was used for Land use / Land cover mapping of 10 km radius for proposed site. The description of the land use categories for 10 km radius and the statistics are given for 10 km radius.

Interpretation Technique

Standard on screen visual interpretation procedure was followed. The various Land use / Land cover classes interpreted along with the SOI topographical maps during the initial rapid reconnaissance of the study area. The physiognomic expressions conceived by image elements of color, tone, texture, size, shape, pattern, shadow, location and associated features are used to interpret the FCC imagery. Image interpretation keys were developed for each of the LU/LC classes in terms of image elements.

April 2016 FCC imagery (Digital data) of the study area was interpreted for the relevant land use classes. On screen visual interpretation coupled with supervised image classification techniques are used to prepare the land use classification.

1. Digitization of the study area (10 km radius from the proposed site) from the topo maps
2. In the present study the IRS –P6 satellite image have been procured and interpreted using the ERDAS imaging and ARC-GIS soft ware adopting the necessary interpretation techniques.
3. Satellite data interpretation and vectorization of the resulting units
4. Adopting the available guidelines from manual of LULC mapping using Satellite imagery (NRSA, 1989)
5. Field checking and ground truth validation
6. Composition of final LULC map

The LULC Classification has been done at three levels where level -1 being the broad classification about the land covers that is Built-up land, agriculture land, waste land, wet lands, and water bodies. These are followed by level –II where built-up land is divided into towns/cities as well villages. The Agriculture land is divided into different classes such as cropland, Fallow, Plantation, while wastelands are broadly divided into, Land with scrub and without Scrub and Mining and Industrial wasteland. The wetlands are classified into inland wetlands, coastal wetlands and islands. The water bodies are classified further into

River/stream, Canal, Tanks and bay. In the present study level II classification has been undertaken.

Field Verification

Field verification involved collection, verification and record of the different surface features that create specific spectral signatures / image expressions on FCC. In the study area, doubtful areas identified in course of interpretation of imagery is systematically listed and transferred on to the corresponding SOI topographical maps for ground verification. In addition to these, traverse routes were planned with reference to SOI topographical maps to verify interpreted LU/LC classes in such a manner that all the different classes are covered by at least 5 sampling areas, evenly distributed in the area. Ground truth details involving LU/LC classes and other ancillary information about crop growth stage, exposed soils, landform, nature and type of land degradation are recorded and the different land use classes are taken.

Description of the Land Use / Land cover classes

The brief detail of the land use in 10 km radius of the project site is given below:

Table 13 : Different Land use classes around 10 km radius from the project site

S.No	Land use	Percentage	Area in Sq.Km
1	Built-Up land (Urban / Rural)	8.62	31.02
2	Double Crop	10.73	38.63
3	Single Crop	36.59	131.70
4	Plantation	7.05	25.39
5	Fallow Land	7.88	28.38
6	Land withour Scrub	8.50	30.59
7	Land with Scrub	3.17	11.41
8	Scrub Forest	2.88	10.36
9	Barren Land	0.16	0.59
10	Mines / Quarry	0.42	1.50
11	Salt affected Land	2.66	9.57
12	Water body	11.34	40.82
	Total	**100.00**	**359.96**

Built-up land

It is defined as an area of human settlements composed of houses, commercial complex, transport, communication lines, utilities, services, places of worships, recreational areas, industries etc. Depending upon the nature and type of utilities and size of habitations, residential areas can be aggregated into villages, towns and cities. All the man made construction covering land belongs to this category. The built up land (Rural / Urban) occupies 8.62 % .

Agricultural land

This category includes the land utilized for crops, vegetables, fodder and fruits. Existing cropland and current fallows are included in this category.

It is described as an area under agricultural tree crops, planted adopting certain agricultural management techniques. Out of all the agricultural lands, Single Crop land occupies maximum of 36.59 % area within 10 km radius.

Forest Land:

These are the areas bearing an association predominantly of trees and other vegetation types (within the notified forest boundaries) capable of producing timber and other forest produce.

Wasteland

Wastelands are the degraded or underutilized lands most of which could be brought under productive use with proper soil and water management practices. Wasteland results from various environmental and human factors.

Land with or without Scrub

This is the land, which is outside the forest boundary and not utilized for cultivation. Land with or without scrub usually associated with shallow, stony, rocky otherwise non-arable lands.

Water bodies

The category comprises area of surface water, either impounded in the form of ponds, reservoirs or flowing as streams, rivers and canals. River cater channel is inland waterways used for irrigation and for flood control.

Conclusion

The study reveals that the following major land use in the study area of 10 km radius from the project boundary

- The agricultural land (single Crop Land- 36.59 %) occupies majority of the area.
- About 7.88 % of the land occupies fallow land
- The project site falls in Fallow land
- About 8.62 % of the built up land is of category.
- The Shrub forest Land occupies about 2.88 % of the study area.

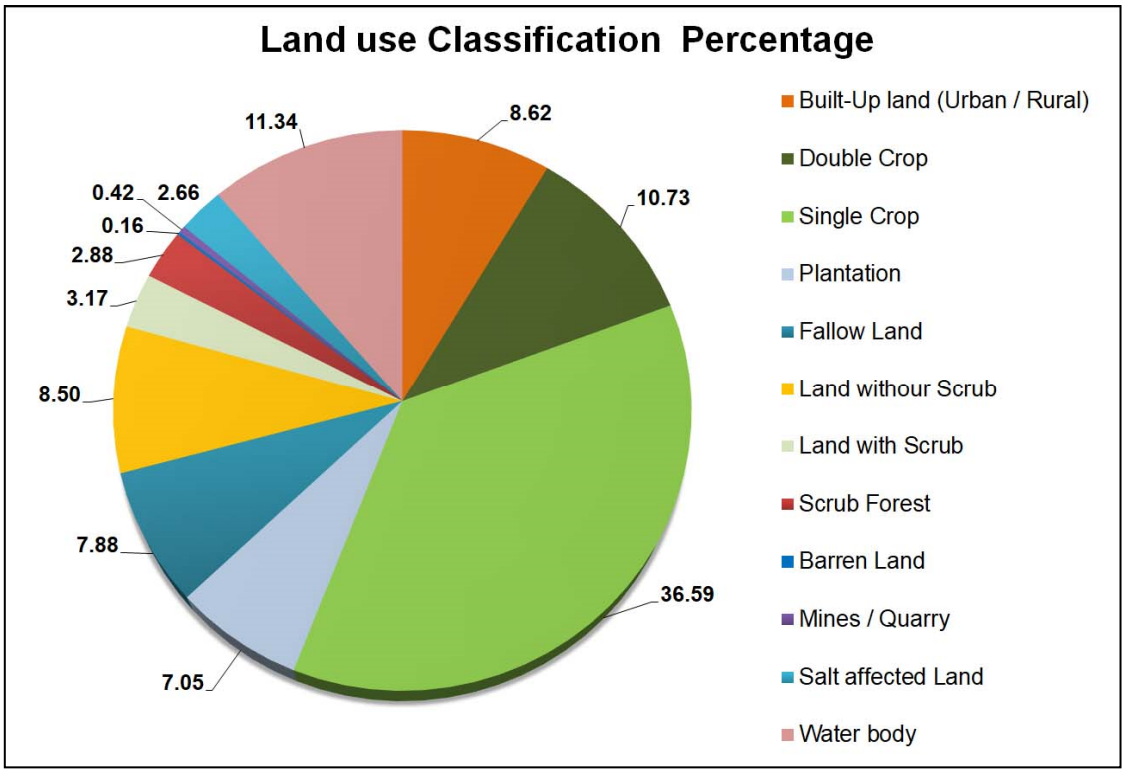


Figure 30: Graphical Representation of Different Land use classes around 10 km radius from the project site

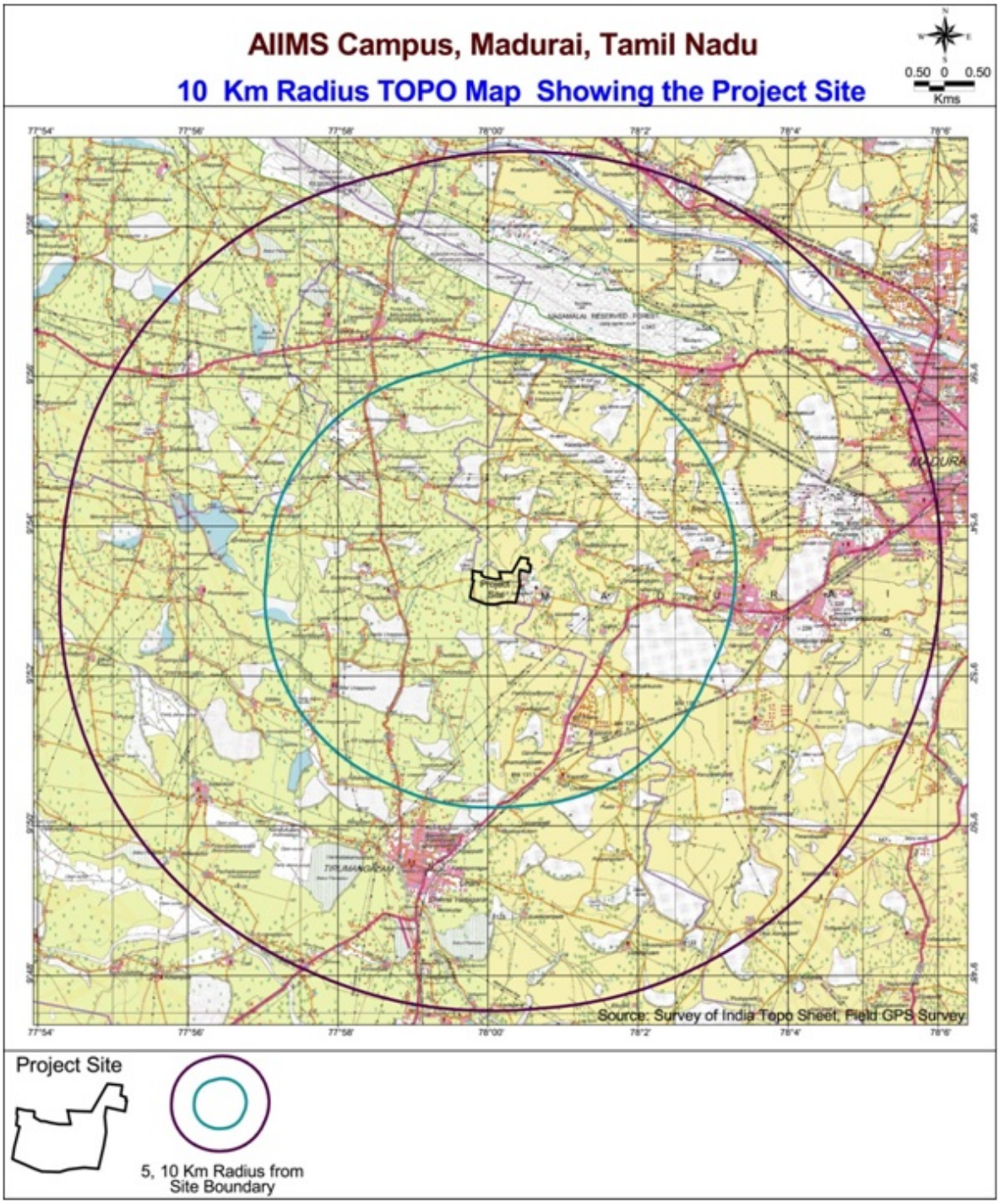


Figure 31 : Topo Map showing the project site and 10 Km Radius

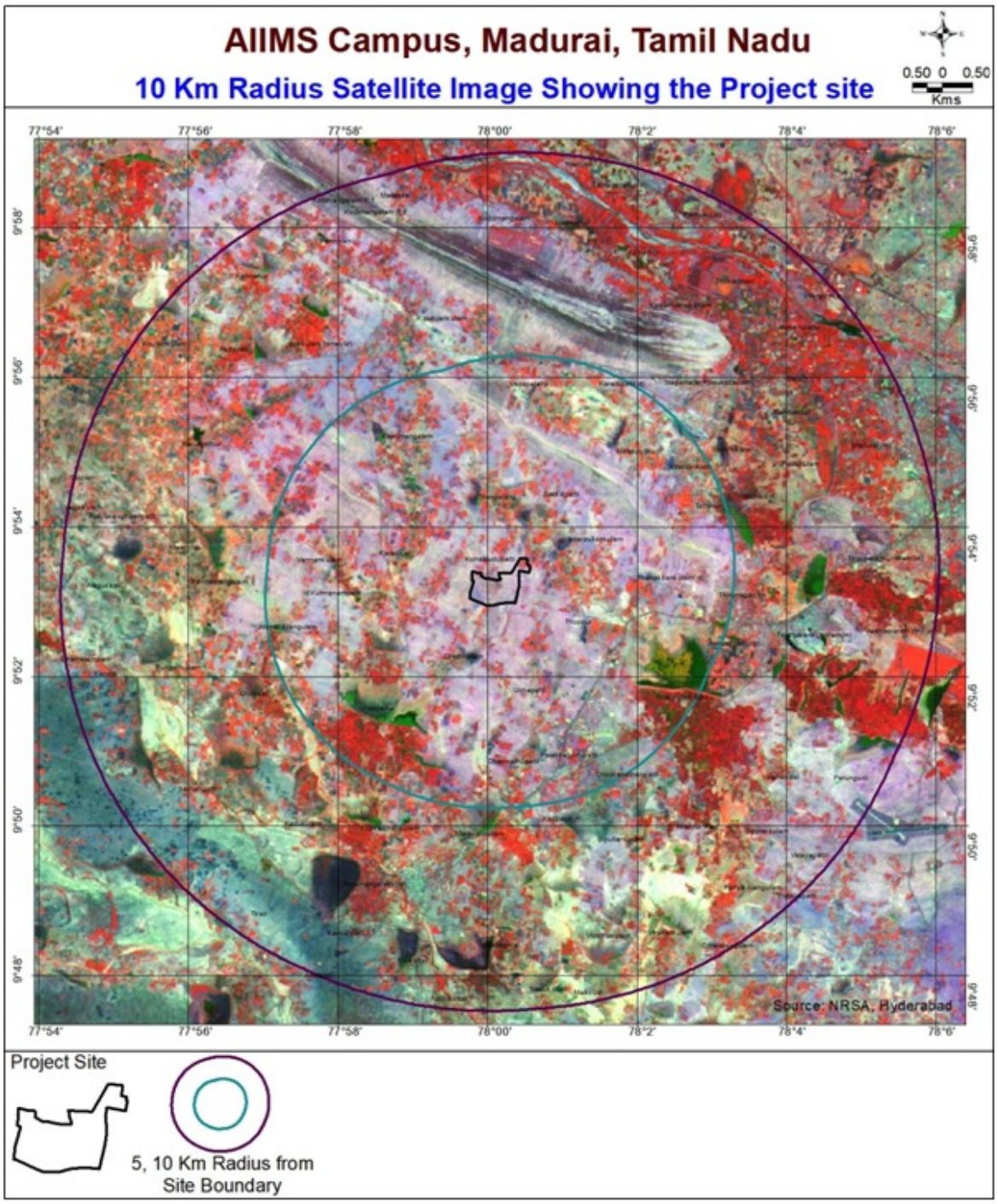


Figure 32 : Satellite image showing the project site and 10 km Radius

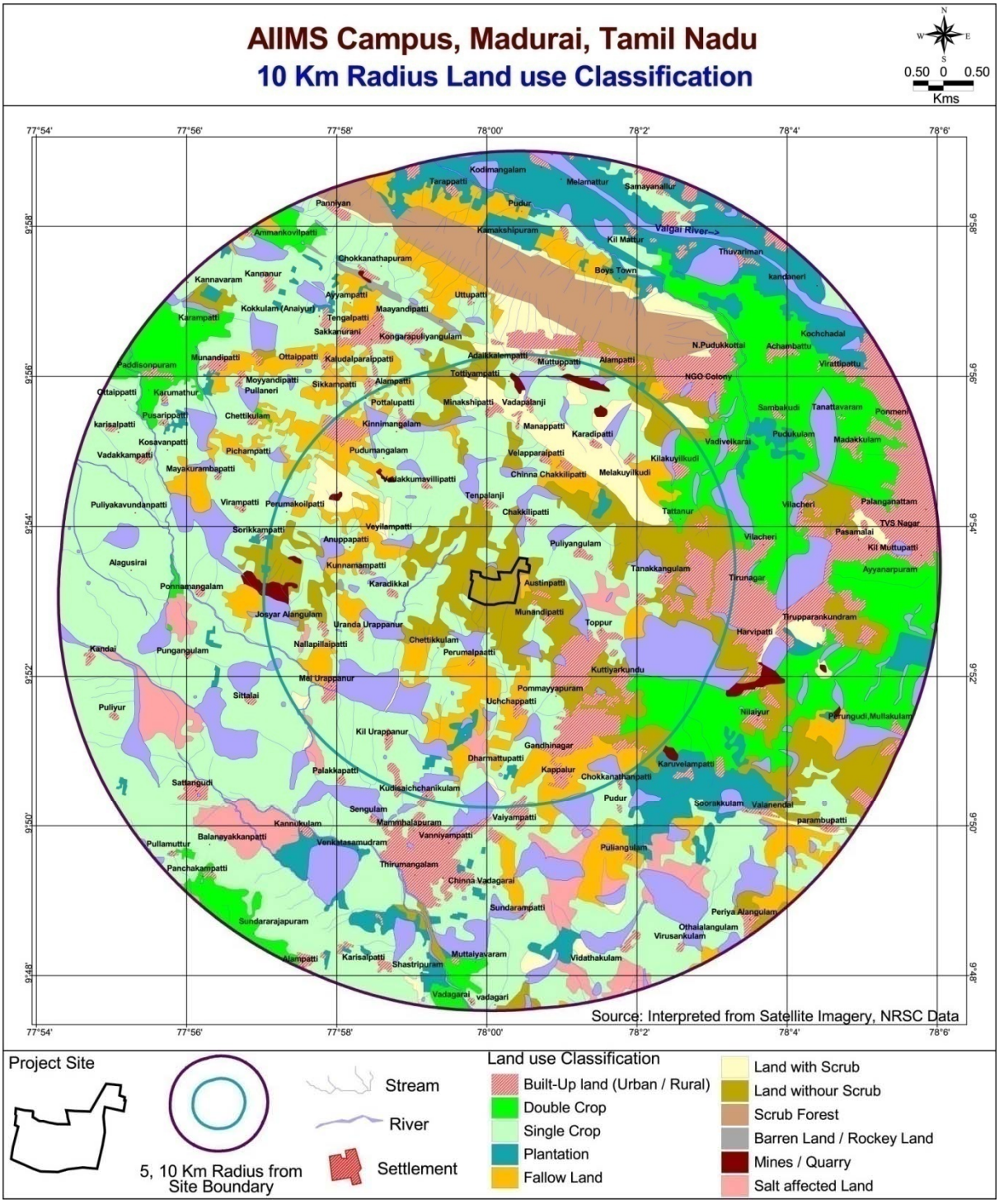


Figure 33 Land Use Classification – 10 km Radius of project site

2.6.2 Seismic Stability

(Source: www.mapsofinidia.com)

Figure 34 : Seismic Stability of India

The project area falls in Zone-II of Seismic Zoning Map of India. Though not as seismically active as states in the northern and western parts of the country, small to moderate earthquakes have occurred in the state of Tamil Nadu. The frequency of earthquakes is low i.e. the gap between moderate sized events is fairly long. Seismic activity in the recent past has occurred in clusters along the borders with Andhra Pradesh, Karnataka and Kerala. Several faults have been identified in this region out of which many show evidences of movement during the Holocene period. The east-west trending Cauvery Fault, Tirukkavilur-

Puducherry Fault and Vaigai River Fault and the north-south trending Comorin-Point Calimere Fault and Rajapatnam-Devipatnam Fault are some of them and run close to major urban centres like Coimbatore, Madurai, Nagapattinam, Thanjavur and Puducherry.

2.7 Economic Activity

With the advent of Small Scale Industries (SSI) after 1991, the industrialization of Madurai increased employment in the sector across the district from 63,271 in 1992–93 to 166,121 persons in 2001–02. Madurai is one of the few rubber growing areas in South India. and there are rubber-based industries in Madurai. Gloves, sporting goods, mats, other utility products and automobile rubber components are the most produced items by these industries. Automobile manufacturers are the major consumers of rubber components produced in the city. There are numerous textile, granite and chemical industries operating in Madurai.

Employment, Income and Poverty

- Madurai, which is agriculture and rural based district, is now exposed to increasing urbanization, textile, construction, real estate and housing. Madurai is nearing the State average in tertiary sector and in the primary and secondary sectors it has to improve more and is yet to reach the State level.
- The district has to concentrate on rural blocks which also play a great role in building the economy. As far as Work Participation Rate (WPR) is considered, there is an increase in total workers of the district due to the increasing trend in urban spread, but in rural areas in certain blocks female WPR is getting reduced where there is need for action.
- Few millet based blocks are there in the district especially, T.Kallupatti, Kallikudi where viable marketing has to be ensured. Certain studies can be taken in the district on the basis of poverty with indicators which will help us know in detail about the status of labour and children in the district.
- Cucumber, cotton and pulse growers are more in the Kallikudi, T.Kallupatti block where role of middlemen problem needs to be addressed feasibility of marketing has to be ensured.
- Regulated Market which is run by Government can be activated effectively which will benefit the marginal farmers.
- Further analysis, at the block level is needed to understand specific regional causes for the backwardness of certain blocks. From the policy angle, there is a need for understanding which policy cause these issues and which can counter them. There is need for putting in place a monitoring system at the district level to monitor changes in WPR, income and poverty situation at the micro level, particularly with reference to various social groups, age group and gender.
- Madurai ranks 9th with respect to the share in State Gross Domestic Product (GDP) having 3.67% contribution to the total state GDP.

- Major economic activities are trade & commerce, tourism related activities and to some extent industrial activities.
- The city houses various health care facilities, automobile, rubber, chemical, and textile manufacturing industries and has also developed into a second tier city for information technology as well.
- Increasing trend of tertiary sector with involvement of 87% population indicating major role of tourism and trade.
- The secondary sector comprising majorly the household handloom industry has declined from 4.06% in 2001 to 3.61% in 2011.
- The WPR is 39% showing an increase over the past decade
- Share of marginal workers has grown from 4.31% in 2001 to 7.49% in 2011 indicating the high percentage of daily wages workers coming from adjacent areas to the city.

Work Force Participation Rate as per Census 2011 is 36 % and the details are presented below:

Table 14 : Work Force Participation as per Census 2011

Details	Number	Percentage (%)
Primary Sector	8,683	2
Secondary Sector	20,614	4
Tertiary Sector	499,264	94
Total Main Worker	528,561	36
Marginal Worker	42,767	3
Total Non Worker	899,427	61
Total Population	1,470,755	
Work Participation Rate	36%	

(Source: http://www.maduraicorporation.co.in/)

Poverty

(Source: DISTRICT HUMAN DEVELOPMENT REPORT 2017 published by State Planning Commission, Tamil Nadu)

Multidimensional Poverty Index- an analysis provides the details of poverty in the Madurai District. The Multidimensional Poverty Index (MPI) is a new measure designed to capture the severe deprivations that people face at the same time. The MPI reflects both the incidence of multidimensional deprivation and its intensity – how many deprivations people experience at

the same time. It can be used to create a comprehensive picture of people living in poverty; MPI builds on recent advances in theory and data to present the first global measure of its kind, and offers a valuable complement to traditional income-based poverty measures. Three dimensions are used to measure the poverty in Madurai district, viz., health, education and living standard with ten indicators.

Table 15 : Dimensions and Indicators for MPI

Dimensions	Indicators
Health	IMR Higher order birth rate Malnourished children
Education	Drop out of in primary Drop out in secondary
Standard of living	Access to cooking fuel Access to toilet facilities Access to drinking water Access to Pucca houses Access to electricity

Kottampatti has poor status, as the block has a Higher Order Birth (HOB) (16.86%), IMR (21.70) and 10% of malnourishment, the dropout rate in the secondary is also higher in the block and access to toilets is only 38.46%. All the factors have close connection with poverty. Malnourishment is also one of the factors contributing to poverty. Melur has the highest percentage of 27.0 followed by Usilampatti and Chellampatti, where efforts need to be taken to have control and regularity in providing nutritious food has to be ensured. Drop out in the primary school is comparatively low in all the blocks as the State had taken steps in ensuring primary education to children. As a result of this, there is not much problem in the primary level of education, but in the case of secondary education in Tirumangalam, Tirupparangunram, Kallikudi, Madurai East and Corporation have a higher percentage of drop outs which has to be prevented. The reason for drop outs in the secondary education may be the affordability to face the education expenditure, going for labour work, early marriage of girl children, less importance to higher education, in remote villages.

The common expectation is to have better standard of living. As far as this indicator is considered rural blocks have less access to cooking fuel, toilet and pucca house. Urban based blocks are having better opportunities towards standard of living. So, focus to be given for the indicators which have the greatest influence in human development.

Table 16 : Top and Bottom Three Blocks in Multidimensional Poverty Index

Top 3 blocks Value		Bottom 3 blocks Value	
Block Name	MPI	Block Name	MPI
Corporation	0.09	Kottampatti	0.63
Tirupparangunram	0.33	Kallikudi	0.60
Tirumangalam	0.39	Sedapatti	0.57

The project site falls under Tirupparangunram Block and the Tirumangalam Block is the nearest block both are listed in the top 3. Tirupparangunram, Corporation and Tirumangalam show better performance in terms of MPI. There is a difference between urban and rural based blocks. This shows that based on the indicators given -health, education and standard of living in urban blocks have better status than the rural blocks. Standard of living, health and education are taken for multidimensional poverty index computation. Out of five indicators, access to cooking fuel, toilet facilities and pucca house perform lower which contributes for the status of poverty, while other two indicators – access to drinking water and electricity perform extremely well among the blocks. In general, the standard of living dimension is better in urban blocks

Indigenous group and ethnic minorities:
(Source: https://en.wikipedia.org/wiki/Ethnic_groups_of_Tamil_Nadu)

Tamil Nadu is one of the 29 states of India. Its capital and largest city is Chennai (formerly known as Madras). Tamil Nadu lies in the southernmost part of the Indian Peninsula and is bordered by the States of Puducherry, Kerala, Karnataka and Andhra Pradesh. It is the tenth-largest state in India and the seventh most populous state. As of 2001 census, Tamil is spoken as the first language by 88.59% of the population followed by Telugu by 5.65 percent, Kannada by 2.68 percent, Urdu by 1.51 per cent, Hindi by 0.64 percent, Malayalam by 0.89 percent, Marathi by 0.1 percent and Saurashtra by 0.1 percent.

The Telugu people or Telugus are also a Dravidian ethnic group of India. They are the native speakers of the Telugu language. According to Census of India, Telugu language has 74 million speakers making it as the third largest spoken language in India after Hindi and Bengali. They are native to the South Indian states of Andhra Pradesh and Telangana. Telugu is also the most widely spoken language in South India. In Tamil Nadu, they are found in Chennai, Madurai, Coimbatore, Trichy, Dindigul, Virudhunagar, Sivakasi, Thiruvannamalai, Vellore, Thanjavur, Tuticorin, Dharmapuri, Salem, Erode, Karur, Namakkal, Thanjavur, Tiruppur, Theni, Perambalur and Ariyalur districts. During the bifurcation of states based upon languages from Madras presidency, Tamilnadu State annexed Chennai instead of Tirupathi. It shows the significant population of Telugu speaking people in Tamil Nadu state.

Saurashtrians are an ethnolinguistic group of people who speak the Saurashtra language, an Indo-Aryan language, residing in the Indian states of Tamil Nadu, Kerala, Andhra Pradesh and Karnataka. Saurashtra, once spoken in the Saurashtra region of Gujarat, is spoken today chiefly by a small population of Saurashtrians settled in parts of Tamil Nadu. With the Saurashtrian language being the only Indo-Aryan language employing a Dravidian script and is heavily influenced by the Dravidian languages such as Tamil and Telugu. However, Census of India places the language under Gujarati. Official figures show the number of speakers of Saurashtra as 185,420 in Tamil Nadu (2001 census). Madurai in the southern part of Tamil Nadu has the highest number of Saurashtrians.

Industrial Development

(Source: http://www.maduraicorporation.co.in/)

Besides achieving parity in industrial growth and for distributing economic activities evenly all over the District, there is a need for building up the infrastructure facilities uniformly. The District Annual Credit Plan envisages implementation of good numbers of innovative and hi-tech projects in the field of agriculture, horticulture, farm forestry, wasteland development, dairy and small-scale industries. The system of transport plays a pivotal role in overall economic development of any area. Madurai District has well laid out roads and railways lines connecting all major towns within and outside the State. The District has possessed a very good communication network. Water that is essential for industrial use and human consumption are also available plenty in most areas of the District. 37 banking groups along with their branches are operating in this District. Banks and other financial institutions play a crucial role in promoting rapid industrial growth. They should formulate the lending strategy taking into consideration of the following factors.

1. Taking lending decisions expeditiously based upon the viability of project reports.
2. Focusing increased attention on developing backward and most backward areas of the District.

Industrial Estates in Madurai

Table 17 : Major Industrial Estates in Madurai

S.No.	Industrial Estate	Number of Units
1	SIDCO Industrial Estate – K.Pudur	85
2	SIDCO Industrial Estate – Kappalur	405
3	Madurai Hosiery Industrial Estate – Uranganpatti	135
4	Madurai Integrated Textile Park – Vadipatti	24

Major Large Scale Industries

- M/s. National Sugar Mills, Mettupatti, Allanganalur,
- M/s. Kothari Bio Chemicals Nagari, Madurai, (Calcium Sennocide)
- Sugar Factory at Panchayarapuram,
- M/s. TVS Chakra Ltd., at Vellaripatty (Manufacturing of Rubber Tyres)
- M/s. Hi-Tech Arai, M/S. Fenner India, Kotchadai(Manufacturing of V-Belts)
- M/s. TVS Sundaram Auto Components,

- M/s. Metal Powder Company (Manufacturing of Synthetic and Nylon Yarn. Teflon Liquid & refrigeration gas debulking.
- M/s. PRP Granites at Melur and M/s. R.K. Granites at Cholavandan.

2.8 Social infrastructure and public facilities

Road Infrastructure

Roads play many roles in actualizing the general development and so human development. The road network is a basic mode of connectivity for linking agriculture, industries, railways, seaports and airports. The main indicators that reveal the efficiency of the road system are the total length of roads, proportion of surface roads, density of road, etc.

The total road length in the district is 3173.75 km. Among the various types of roads, Bituminous Tar roads were higher (2029.58 kms, 64%), followed by mud roads (514.62 kms,16%). The status of saralai road length is lower (229.64 kms, 7.2%) followed by WBM II road(269.99 kms, 8.51%) and WBM III road(25.71 kms, 0.81%). Across the block, road length shows disparity.

There are 30,126 registered three-wheeled vehicles called auto rickshaws, which are commercially available for renting within the city. In addition to the government operated city buses that are used for public transport, there are 236 registered private mini-buses that support local transportation. Madurai connects with the following major national highways;

The National Highways NH 7, NH 45B, NH 208 and NH 49 pass through Madurai. The state highways passing through the city are SH-33, SH-72, SH-72A, SH-73 and SH-73A which connect various parts of Madurai district. Madurai is one of the seven circles of the Tamil Nadu State Highway network. Madurai is the headquarters of the Tamil Nadu State Transport Corporation (Madurai) and provides local and inter-city bus transport across the districts of Madurai, Dindigul, Sivagangai, Theni, Virudhunagar, Madurai has three bus terminals, namely, M.G.R. Bus Stand and Arappalayam (for inter city buses) and Periyar Bus Stand (for intra city buses).

Table 18 : List of National Highways passing through Madurai

Road	No.	Route
National Highway	7	Kanyakumari - Tirunelveli - Madurai City - Salem - Bengaluru - Varanasi
National Highway	45 B	Thoothukudi - Madurai - Trichy - Viluppuram - Chennai (Grand southern Trunk Road)
National Highway	49	Rameswaram - Thiruppuvanam - Madurai - Kochi
National Highway	85	Thondi - Sivagangai - Madurai - Theni - Kochi (Point Highway)
National Highway	208	Madurai - Rajapalayam - Tenkasi - Sengottai - Kollam

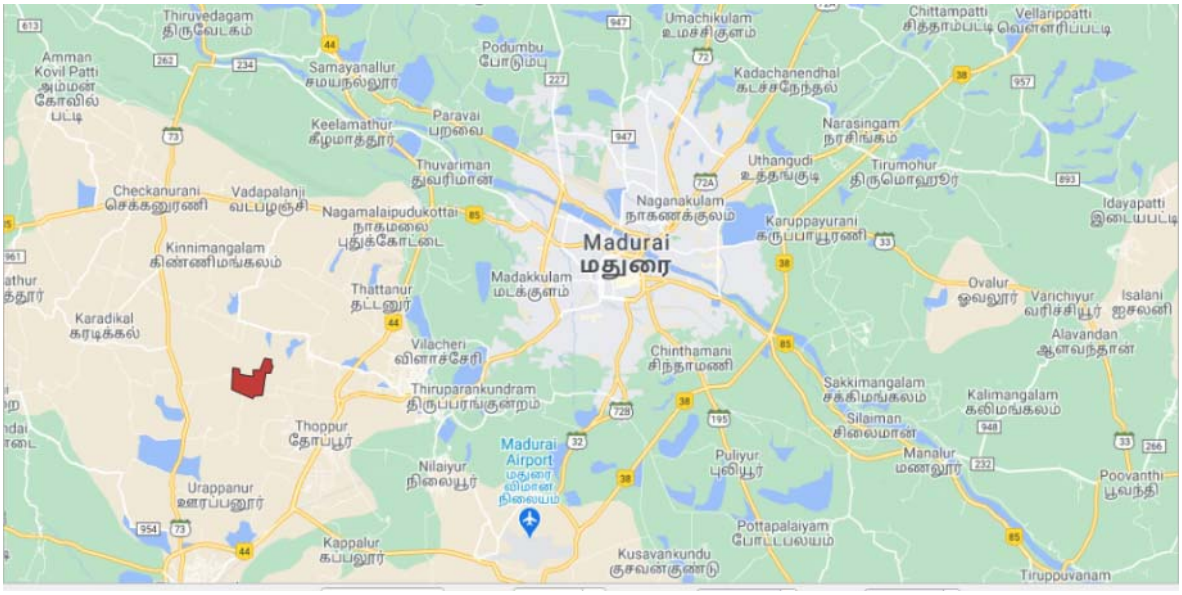


Figure 35 : Major Highways in Madurai

Water supply

Drinking water supply for Madurai city is currently abstracted from three sources: Vaigai dam (115 million liters per day [MLD]), Cauvery river (30 MLD), and Vaigai riverbed (47 MLD). The city has existing water treatment plant (WTP) of capacity 118.6 MLD commissioned in 1995.

The current water supply from various sources is assessed at 192 MLD while the total water supply demand including the transmission losses for the intermediate (2034, population-1.92 million) and ultimate (2049, population-2.28 million) year is estimated at 317 MLD and 374 MLD respectively. To meet the demand gap of 125 MLD for the intermediate year 2034, under ADB funded TNUFIP, following subproject components are proposed:

Construction of check dam, intake well and head works at MullaiPeriyar River at Lower Camp to draw 130 MLD of raw water; and (ii) Laying of 95.74 kilometers (km) of raw water main of 1,100 mm dia. from head works to proposed WTP at Pannaipatty.

Distribution of public facilities

The various public facilities such as water supply, sanitation, solid waste management, market, roads, solid waste management are provided and maintained by Local body (Corporation, Municipalities, etc.).

Market facility

Market on daily/ weekly basis are places in prominent locations to the public. The list of market within the Corporation Limits are as follows:

Table 19: List of Market in Madurai Corporation

Ward No	Name of the Markets	Location
6	MattuThavani Cattle Market Thursday (Weekly Market)	Melur Road – Opposite SETC Depot
69	Bypass Road Chockkalinga Nagar Friday (Weekly Market)	Palanganatham Bypass Road
1	Kamarajar Bridge Northern Side Saturday (Weekly Market)	Near Theekkathir Office
44	South Gate Market (Daily Market)	Southveli Street Chinnakkadai Street
48	Fish Market (EastVeli Street)	Near Nelpettai
54	Old English Club lani Market	Near Sourastra Higher Sec. School KamarajarSalai
15	Jampuropuram Market	Near Goripalayam Masque
45	Mahali patty Market	New Mahali patty Road Near St.Marys Higher Sec.School.
41	East Madurai Colony Market	Near East Madurai Railway Station (Ram Theatre)
18	Ahimsapuram Market	Sellur – Palam Station Road Ahimsa Puram
41	Jaihindu Puram Market	Jaihindu Puram
48	East Marret Street Market	Near SamySannathi street
58	Keeraithurai Market	Near "New Delux" Theatre Keeraithurai
43	Fish Market (SouthVeli Street)	Near South Gate Police Station
37	Pasumpon Muthuramalingam Daily Market (Central Market)	Near Meenakshi Temple North AvaniMool Street.
47	Khanpalayam Market	Near KamarajarSalaiArasamaramVinayagar Temple.
54	Krishnapuram Cross Street Market	Opposite ArasamaramVinayagar Temple
48	Country Chinken – Sales	East Veli Street Near Nel Pettai
24	Ram Nagar Market	Karimedu – Mothilal Main Road.
40	Kazhimar Street Market	Kazhimar Street
42	Subramaniapuram Market	Subramaniapuram Main Road
70	Vellaikkannu Theatre Road Mugai Market	Arasaradi
49	Munichalai Road Market	Munichalai Road – Opposite Masque
55	Gatelock Road – Market	Near Madura Coats –Road Anuppanadi
45	Thavittusanthai Market	Southveli Street- South Marret Street – Meeting Point
5	K.Pudur Market	Near P.R.C. Depot K.Pudur

Bus Stand

The entire district of Madurai has internal access and access to other parts of Tamil Nadu as well as surrounding states of Tamil Nadu by Periyar Bus Stand and M.G.R Bus Stand.

Madurai Corporation -Periyar Bus Stand

Madurai Corporation - M.G.R Bus Stand

Figure 36 : Major Bus Stand in Madurai

Road facilities

Madurai Corporation maintaining 1572.38 Kms length of roads. 22.58 Kms of Stone cut & Tiles paved roads. The details of the type of roads and its lengths are furnished below:

Table 20 : Road facilities in Madurai

Roads	Length in KM
Bus Route Roads	162.87 Km
Ring Road	27.20 Km
Internal Road	239.66 Km
Total	532.22 Km

Sewerage facilities

The sewage generated from the households are collected through the underground drainage (UGD) system having total length of 206.09 km and open drainage system having total length of 165 km. Considering the contour of the natural ground the pumping stations are installed to carry the sewage. The main pumping stations in Madurai are as follows:

Table 21 : Sewage Pumping Stations in Madurai

SOUTH ZONE - Main Pumping Stations	
1	Santhapettai
2	Thavittusandhai
3	Melavasal
4	West Marret-Canara Bank
5	Sunday Market
6	Karukagapillai Kara Lane
7	Thaikkal
8	Puttuthoppu
9	Arapalayam-New
NORTH ZONE	
1	MundiriThoppu
2	Thathaneri
3	K.K.Nagar
4	Anna Nagar
5	Anna Nagar UzhvarSandhai-New

Solid Waste Management (Source)

The Collection, transportation and disposal of municipal solid waste is an obligatory function of the Madurai Corporation. The Municipal Solid Waste mainly comprises waste from households, market, commercial establishments, hotels, hospitals and industries in the town. The public health department of the corporation, headed by City Health Officer and Assistant Health Officer is responsible for the Solid Waste Management in the city. For the efficient administration and for day-to-day operational purposes, the town is divided into 4 Zones covering all the 100 Municipal Wards.

In Madurai City garbage is generated at the rate of 406 gram per day per capita accumulating to a massive quantum of 548 Metric Ton per day. This is slightly higher when comparing similar level of cities where the per capita generation of waste is around 400 grams per day and the reason for the excess rate of creation of waste is due to the heavy influx of floating population which is estimated to be around 3 lakhs. Out of the accumulated garbage released by the houses, shops, daily and weekly markets, commercial establishments, hotels, hospitals and industries, garbage generated from the house account of 64%. Household wastes contain mainly residual vegetables and food which could be easily disposed. But the scientific disposal of solid waste such as plastic, paper discharged by the commercial establishments, without affecting the environment remains to be a great challenge.

The various sources of waste generation in Madurai are detailed below:

Table 22 : Source of Solid Waste Generation

S. No.	Source	Quantity Tones per day	Composition percentage
1	Domestic	288.00	64 %
2	Commercial	108.00	24 %
3	Industrial	-	-
4	Hospitals & Clinics	18.00	4 %
5	Others	36.00	8 %
6	TOTAL	450.00	100 %

2.9 Land acquisition / Involuntary resettlement

The land acquisition in any part of Tamil Nadu is mainly based on The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCT LARR), 2013 and the RFCTLARR Rules, 2017 Notified by Government of Tamil Nadu.

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCTLARR ACT 2013):

The RFCTLARR Act applies to acquisition of land for public purpose, as defined in the act. The RFCTLARR Act, 2013, provides for a transparent process and just and fair compensation to the affected families whose land is acquired or proposed to be acquired or are affected by such acquisition and provides for rehabilitation and resettlement of the affected families. The basic principle of the RFCTLARR Act is to ensure that the cumulative outcome of compulsory land acquisition should be such that, the affected persons become partners in development, leading to an improvement in the standard of living after acquisition. This act came into effect on 1 January 2014 and the Land Acquisition Act, 1894 stands repealed. The Act lays down procedures for estimating fair compensation of the affected families (and not just the titleholders) due to land acquisition, rehabilitation and resettlement. The Act prohibits acquisition of multi-cropped irrigated land as a special provision to safeguard food security, unless in exceptional circumstances as a demonstrable last resort.

List of Enactments Regulating Land acquisition and Rehabilitation and resettlement

1. The Ancient Monuments and Archaeological Sites and Remains Act, 1958 (24 of 1958).
2. The Atomic Energy Act, 1962 (33 of 1962).
3. The Damodar Valley Corporation Act, 1948 (14 of 1948).
4. The Indian Tramways Act, 1886 (11 of 1886).
5. The Land Acquisition (Mines) Act, 1885 (18 of 1885).
6. The Metro Railways (Construction of Works) Act, 1978 (33 of 1978).
7. The National Highways Act, 1956 (48 of 1956).
8. The Petroleum and Minerals Pipelines (Acquisition of Right of User in Land) Act, 1962 (50 of 1962).

9. The Requisitioning and Acquisition of Immovable Property Act, 1952 (30 of 1952).
10. The Resettlement of Displaced Persons (Land Acquisition) Act, 1948 (60 of 1948).

(Source: The Fourth Schedule, RFCTLARR Act, 2013)

General Steps in Land Acquisition Process Flow Chart RFCTLARR Act, 2013

1. Requisition for Land Acquisition
2. Action by the Collector
3. Estimation and deposit of cost
4. Social Impact Assessment (SIA)
5. Submission of SIA Report
6. Expert Group appraisal and evaluation
7. Publication of Preliminary Notification
8. Hearing of objections
9. Land Records updation
10. Preparation of Draft R&R scheme by Administrator
11. Publication of Declaration and Summary of R & R
12. Development Plan for SC / ST
13. Determination of compensation
14. Enquiry & Land Acquisition Award by Collector
15. Notices to the persons
16. Power to take possession
17. Reference to Authority

(Source: RFCTLARR Act, 2013)

2.10 Historical and cultural heritage

The ancient city of Madurai, more than 2,500 years old, was built by the Pandyan king, Kulashekarar, in the 6thcentury B.C. But the reign of the Nayaks marks the golden period of Madurai when art, architecture and learning flourished expansively. The most beautiful buildings in the city including its most famous landmark, the Meenakshi temple, were built during the Nayak rule. The list of historical and cultural heritage in the Madurai city is as follows:

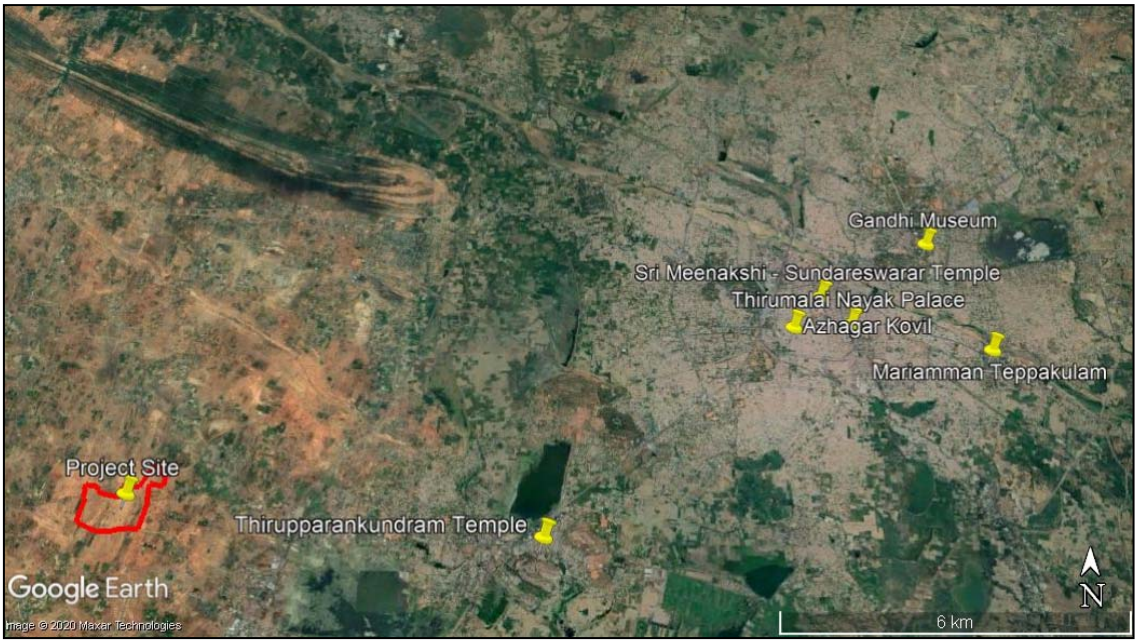


Figure 37 : Google Satellite Image showing Historical and Cultural heritage in Madurai and AIIMS Project Site

Mariamman Teppakulam

Mariamman Teppakulam is a beautiful square tank spread over a huge area of almost 16 acres, located about 4 Kms East of Meenakshi Temple in Madurai City. The tank is the scene of the colourful float festival held in January/February to celebrate the birth anniversary of King Thirumalai Nayak, who built this tank. The deities of Meenakshi and Sundareswarar are placed in a float, called "Teppam", decorated with flowers and illuminated with hundred of lights. This float is taken around the tank to the sound of traditional music. On the Northern side of the tank a temple is dedicated to Mariamman, a famous village deity of Tamil Nadu.

Azhagar Kovil

About 21 Kms North East of Madurai, stands a celebrated Vishnu Temple dedicated to Lord Alagar. The temple is situated on a hill amidst panoramic surroundings. The shrine is known as Alagarkoil and the hill ,Solaimalai. The temple also contain some beautiful carvings and makes the visit rewarding. Palamudirsolai, one of the six abodes of Lord Subramaniya is located atop the Hill.

Gandhi Museum

Gandhi Museum is housed in the old Palace of Rani Mangammal, the Gandhi Museum depicts the highlights of the freedom struggle and contains a picture gallery of the Gandhian

movement. Also can be seen are a gallery of relics, Khadi and village industries section and South Indian Handicrafts section.

Sri Meenakshi - Sundareswarar Temple

Synonymous with Madurai is the Meenakshi Sundareswarar twin Temple, the pivot around which the city has evolved. The Meenakshi Temple complex is literally a city – one of the largest of its kind in India and undoubtedly one of the oldest too. The temple grew with the contribution of each dynasty and victorious monarchs, into an enormous complex extending over an area of 65000 Sq. m. The temple first came in to being 2000 years ago and was substantially expanded during the regime of ThirumalaiNayak(1623-55 AD).

Lord Siva in his incarnation as Sundareswarar and his fish-eyed spouse, Meenakshi, are enshrined in this twin temple. There are five massive gateways enclosing these two shrines. Even a casual visitor is fascinated by the many paintings and sculptures.

A striking feature of the temple is the astonishing structure known as "Ayiramkaal Mandapam" or the Hall of Thousand Pillars and each pillar features high, ornate, bold sculptures that look life like. View from any angle these pillars appear to be in a straight line, an architectural masterpiece indeed In the outermost corridors are situated the matchless musical pillars carved out of stones. When it is tapped, each pillar produces different musical note.

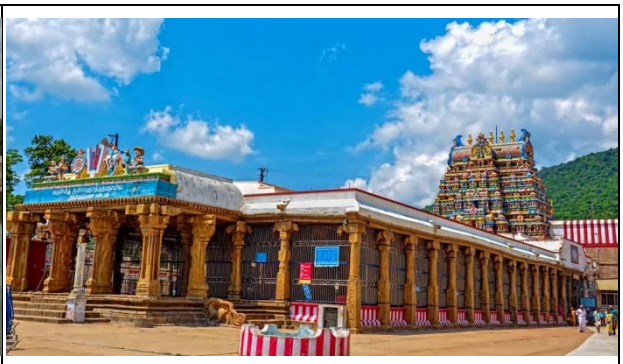
Thirupparankundram Temple

One of the six special abodes dedicated to Lord Murugan or Lord Subrahmanya is located 8 Kms South of Madurai. The importance of this temple is that the marriage of Lord Subrahmanya with Devayanai, the daughter of Indra, was celebrated here. The Cave shrines here are calculated as 8th century creation of the Pandiyans. The Sanctum Sanctorum is carved out of a single rock and the temple is believed to be in existence for many centuries. The walls and the pillars have fascinating carvings.

Thirumalai Nayak Palace

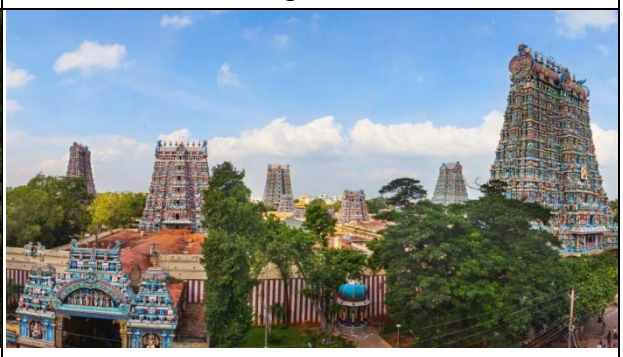
About 1.5 Kms from the Meenakshi temple, this palace was built in 1636 by the ruler whose name it bears. The imposing edifice is famous for the "Stuccowork" on its domes and impressive arches. The Sorgavilasam (Celestial Pavilion), measuring 75m x 52m, constructed entirely of brick and mortar without the support of a single rafter or girder, is a marvel of Indo-Saracenic architectural style. Among other striking features of the palace are the massive white pillars, several of which line the corridor that runs along the courtyard. Connected by high decorated arches, these pillars measure 20m in height and have a circumference of 4m. Elsewhere, there are polished black stone pillars of varying heights.

MariammanTeppakulam



Azhagar Kovil

Gandhi Museum



Sri Meenakshi - Sundareswarar Temple

Thirupparankundram Temple

Thirumalai Nayak Palace

Figure 38: Photos of Historical and Cultural heritage in Madurai

2.11 Health, Sanitation and Hazard

Madurai District is equipped with Medical Services Rending Institutions and Primary Health Centres across the District as part of health management system. Epidemics are Public Health emergencies. Infectious diseases are major causes of morbidity and mortality. The Director of Public Health and Preventive Medicine declared following diseases as notifiable diseases.

Table 23 : Notifiable diseases in Madurai District

S.No	Diseases
1	Cerebrospinal fever
2	Chickenpox
3	Diptheria
4	Leprosy
5	Cholera

6	Measles
7	Plague
8	Rabies
9	Scarlet fever
10	Smallpox
11	Typhoid/Enteric Fever
12	Tuberculosis
13	Infectious Hepatitis
14	Epidemic influenza
15	Whooping cough
16	Virus Encephalitis
17	Hemorrhagic fever
18	Malaria
19	Tetanus
20	Poliomyelitis
21	AIDS

(Source: https://www.tnhealth.org/)

Acute Diarrhoeal Diseases and suspected cholera are common among the water borne diseases. Tamil Nadu is endemic for Acute Diarrhoeal Diseases with sporadic outbreak of cholera in most of the districts throughout the year, and in epidemic proportions during the rainy seasons and peak summer periods.

Table 24 : Details of Disease Outbreak

Year	Acute Diarrhoeal Diseases		Cholera	
	Cases	Deaths	Cases	Deaths
1997	78,025	520	2261	2
1998	77,677	368	1807	0
1999	74,583	266	1807	1
2000	64,130	195	1328	1
2001	59,511	159	1110	1
2002	69,889	199	1591	3
2003	58,784	66	390	1
2004	77,333	119	1500	2
2005	70,465	65	777	1
2006	52,555	22	152	1
2007	37,556	19	212	0
2008	57,463	62	994	0
2009	87,207	21	826	0
2010	60,314	45	932	1
2011	206,669	24	580	0
2012	198,317	17	516	0
2013	189,288	24	146	0

2014	176,795	6	18	0
2015	183,868	0	26	0
2016	184,952	0	4	0
2017	150,429	1	0	0
2018	135,558	0	0	0
Jan-19	9,767	0	0	0
Feb-19	8,876	0	0	0
Mar-19	10,471	0	0	0
Apr-19	8,481	0	0	0
May-19	12,965	0	0	0
Jun-19	11,132	0	0	0

(Source: https://www.tnhealth.org/)

Morbidity of infectious diseases – HIV/AIDS

District Epidemiological Profiling exercise included the generation of reports describing the HIV profile and programme response in each district, identification of information gaps for planning strategic information activities, capacity building of district level personnel in data management, institutional strengthening and fostering linkages between programme units and academic institutions for addressing strategic information was published as an outcome by National AIDS Control Programme.

HIV Epidemic Profile:

- Based on 2012 HSS-ANC data, HIV positivity was low at 0.25% among the ANC attendees, with a stable trend in recent years.
- According to 2012 PPTCT data, the level of HIV positivity was low at 0.11% among the PPTCT attendees, with a long term decreasing trend.
- According to 2012 Blood Bank data, the level of HIV positivity was low at 0.08% among the Blood Bank attendees, with a stable trend.
- According to 2010 HSS-FSW data, HIV positivity was low at 0.40%, among the FSWs. This is very different from previous data points.
- In 2012, HIV prevalence among ICTC attendees was low among male (1.59%) and female (2.11%) attendees as well as among referred
- (1.68%) and direct walk-in (3.11%) attendees, representing a general decreasing trend among all the ICTC attendees.
- According to HRG size 2008 mapping data, FSW (2,614; 69.36% of the total HRG) was the largest HRG in the district followed by (1,155; 30.64% of the total HRG).
- In 2012, 9,358 STI/RTI episodes were treated and the syphilis positivity rate among STI clinic attendees was 1.59%.
- As per the 2001 Census, 4.97% of the male population were migrants; among them 10.68% migrated to other states and 40.14% migrated to other districts within the state.
- According to DLHS-III data, HIV awareness rate and STI/RTI awareness rate among women was 97.3% and 24.1%, respectively.

- In 2012, there was only one FSW TI site operational in the district, although there were over 3,500 individuals classified as HRGs.

(Source: https://tnsacs.in/)

Coronavirus

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus.Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. The table below presents the status regarding COVID-19 in Madurai.

Table 25 : COVID-19 virus spread in Madurai

COVID-19 Status as on 28/09/2020					
District	Confirmed	Active	Recovered	Deceased	Tested
Madurai	11,797	1,786	9,733	278	97.3K

(Source: https://www.covid19india.org/)

2.12 Gender equality

Gender Development Index (GDI):

GDI is the touchstone of the position of women in society. The GDI (2001) for Tamil Nadu is 0.654. GDI values for the districts in Tamil Nadu vary from 0.766 in Chennai to 0.582 in Dharmapuri and Villupuram. The status of women was the lowest in Dharmapuri in terms of literacy rate, enrolment ratio and Life Expectancy at Birth which are reflected in low GDI as shown in Table 26.

Table 26 : Gender Disparity Index: Major States

States	**1981**		**1991**	
	Value	**Rank**	**Value**	**Rank**
Andhra Pradesh	0.744	2	0.801	3
Assam	0.462	14	0.575	12
Bihar	0.471	13	0.469	14
Gujarat	0.723	4	0.714	6
Haryana	0.526	12	0.714	6
Karnataka	0.707	6	0.753	5
Kerala	0.872	1	0.825	1
Madhya Pradesh	0.664	8	0.662	9
Maharashtra	0.740	3	0.793	4
Orissa	0.547	11	0.639	10
Punjab	0.688	7	0.710	7
Rajasthan	0.650	9	0.692	8
Tamil Nadu	**0.710**	**5**	**0.813**	**2**
Uttar Pradesh	0.447	15	0.520	13

West Bengal	0.556	10	0.631	11
All India	**0.620**	**-**	**0.676**	**-**

Source: National Human Development Report, 2001.

The table below exhibits the district-wise Human Development Index (HDI) and Gender Development Index (GDI) values of the State.

Table 27 : District-wise HDI and GDI Values, 2001

District	HDI Value	GDI value
Chennai	0.757	0.766
Kancheepuram	0.712	0.710
Thiruvallur	0.654	0.651
Cuddalore	0.644	0.643
Villupuram	0.587	0.582
Vellore	0.658	0.655
T.V. Malai	0.612	0.608
Salem	0.626	0.625
Namakkal	0.636	0.631
Dharmapuri	0.584	0.582
Erode	0.658	0.656
Coimbatore	0.699	0.697
The Nilgiris	0.685	0.686
Trichi	0.671	0.671
Karur	0.647	0.641
Perambalur	0.596	0.592
Thanjavur	0.630	0.629
Nagapattinam	0.654	0.652
Thiruvarur	0.637	0.633
Pudukkottai	0.618	0.615
Madurai	**0.661**	**0.661**
Theni	0.628	0.628
Dindigul	0.641	0.638
Ramanathapuram	0.629	0.626
Virudhunagar	0.651	0.649
Sivagangai	0.640	0.635
Tirunelveli	0.658	0.656
Thoothukudi	0.703	0.703
Kanniyakumari	0.711	0.708
Tamil Nadu	**0.657**	**0.654**
All India	**0.571**	**0.553**

Source: Tamil Nadu Human Development Report, State Planning Commission.

The comparison between the two shows that if the GDI rank is less than the HDI value in a district, the position of women in that district is very poor compared to men. If the GDI is greater than HDI, there will be greater gender equality in human development. In terms of

GDI Chennai is well placed, followed by Nilgiris, where the GDI is higher than HDI. In the districts of Tiruchy, Madurai, Theni and Thoothukudi, the HDI and GDI are found to be the same, indicating absence of gender inequality. In the district of Dharmapuri though the GDI is the lowest, in relative terms it is lower in Karur, Villupuram, Namakkal and Sivagangai, where the differences between HDI and GDI is higher. Compared to all-India, the gender bias is very low in Tamil Nadu.

2.13 Topography

For the Study area (10 Km Radius) the elevation ranges from 110 m to 380 m amsl. The maximum elevation is observed in the northern part of the study area. The project site is plain ground. The maximum and minimum elevation of the project site is 149 m and 151 mamsl respectively. Physiographic map covering 10km radius of project site is presented in the following figure.

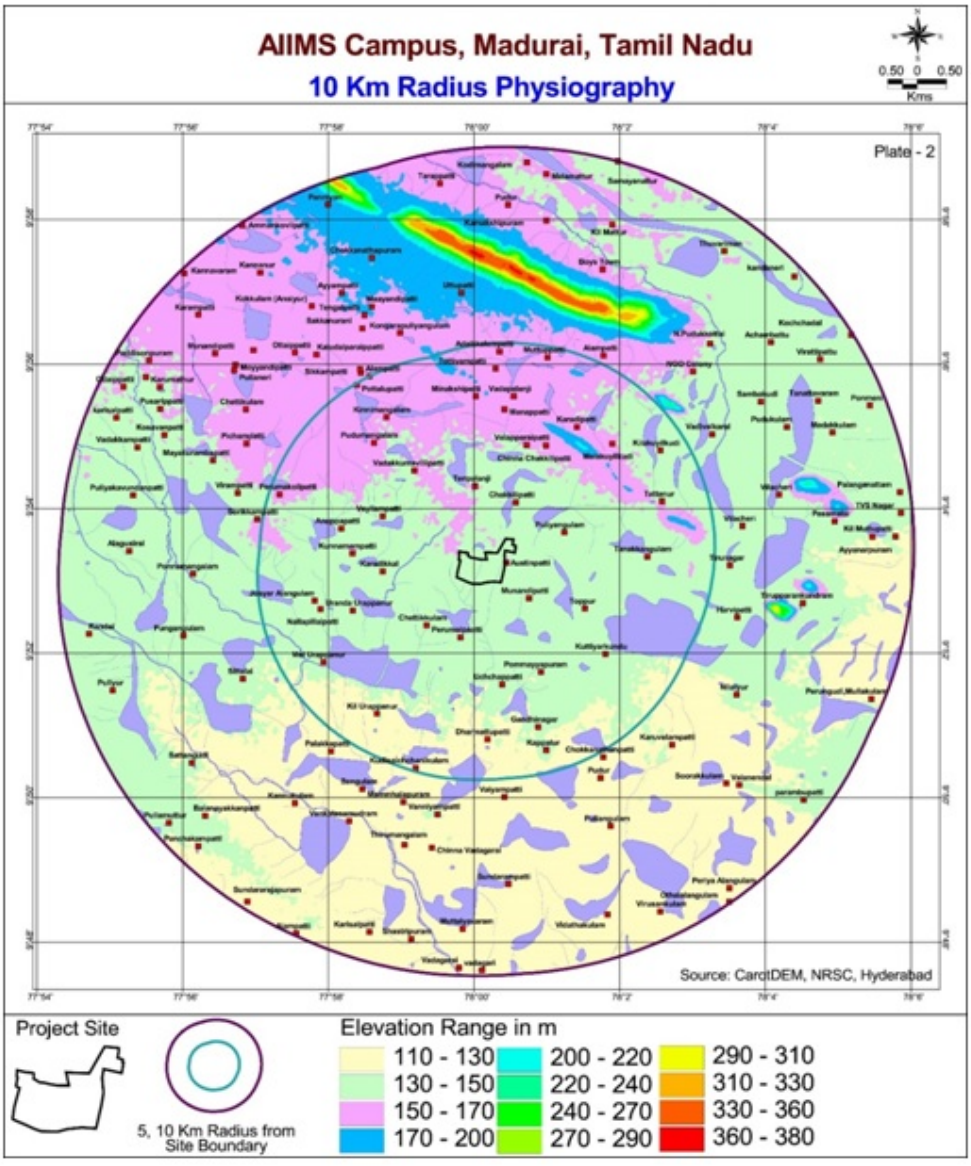


Figure 39 : Topography Map covering 10km radius

2.14 General Geology

Geologically, the entire district can be broadly classified into hard rock and sedimentary (alluvium) formations.

a) Hard rock

More than 90% of the district is underlain by hard rocks. The gneissic type of formation is found on the western portion in the Western Ghats and its offshoots, Cumbum valley, north of Thirumangalam, parts of Melur, etc., Infact, this is the majorformation among the various types of hard rocks.

Charnockite occurs as distinct pockets in parts of Periyakulam, Melur,Thirumangalam and Usilampatti taluks. Quartzites which are resistant to weathering are also seen as patches in Charnockite and gneissic varieties.

Valley fill sediments composed of admixtures of calcareous mud, clay, silt and sand occur in several places in the western portion particularly in Uthamapalayam and Usilampatti taluks. Good deposits are found in Cumbum valley, Varshanad valley and near Palakombai. These are the products of quick transportation of weathering material from the adjacent mountain slopes around the valley.

b) Sedimentary (Alluvial) formation

Alluvial deposits such as sand, silt, stiff clay, gravel, etc., which are transported sediments by the river are found on either side of Vaigai near Madurai and Vadipattiblocks. These formations are overlying the hard rock as a thin layer.
(Source: http://nwm.gov.in

The study area (10 km radius of project site) including the project site comprises of Khondolite, Migmatite, Quatrzite, Charnockite, Clac-Gneiss and along the river Alluvium with sand silt dominant The geology map obtained from Geological Survey India (GSI) for 10 km radius area depicts that most of the area is composed of Charnockite. The project site is located in Charnockite. The map showing the geological formation of the project and 10 km radius of the project is given in following figure.

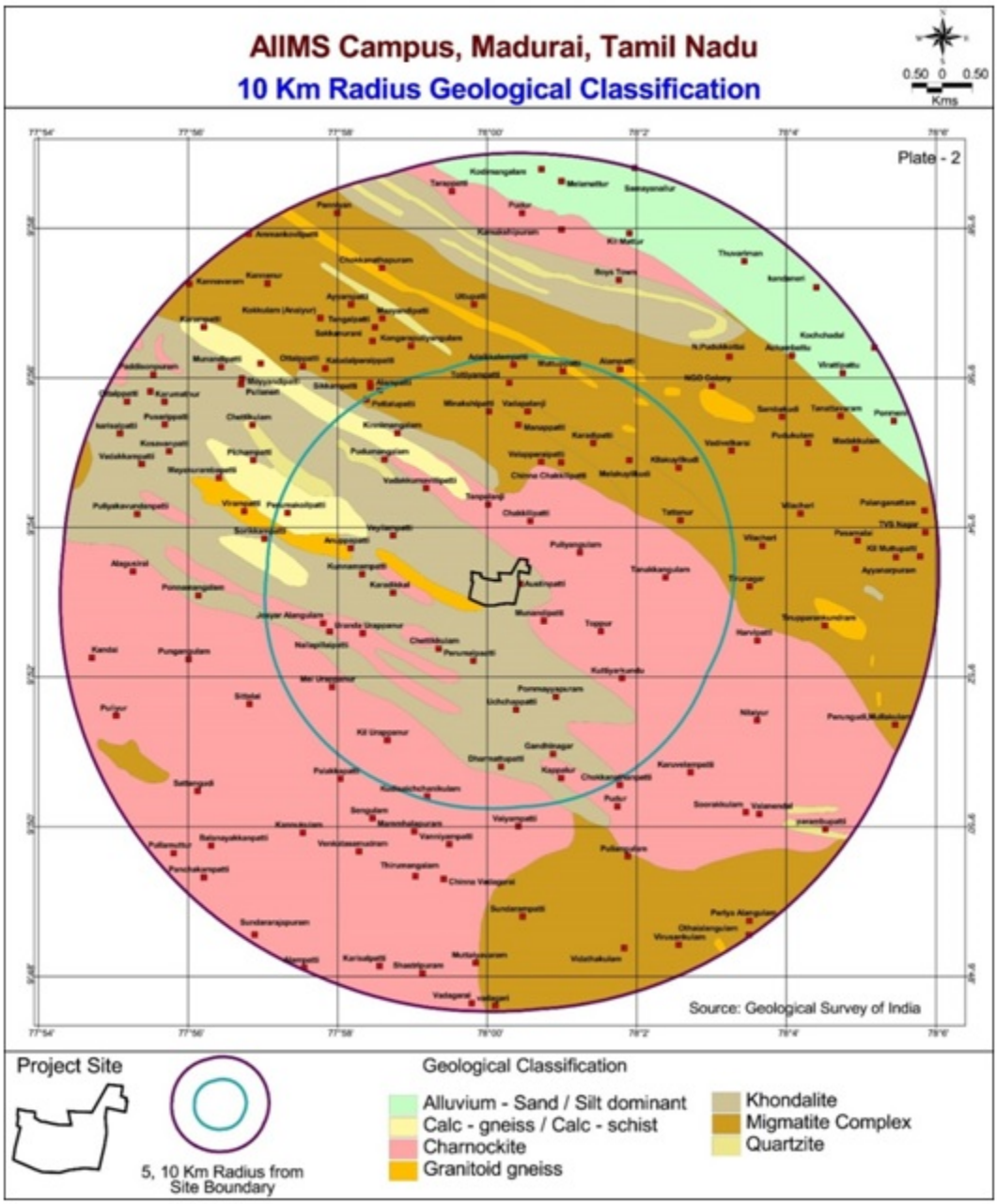


Figure 40 : Map showing the Geological Classification of the Study area

2.15 Hydrology

In Madurai District, during the pre monsoon, the water level generally is in the declining trend ranging from G.L. to 15m. The depth of well below a Ground Level of 12.0m generally become dry during the hot season i.e. in the months of May, June, July. In the post monsoon, the water level generally is in the upward trend due to rainfall and it may reach the Ground Level also. The long term fluctuations of water levels range from G.L. to 14.0m in many parts of the Madurai District.

(Source: http://nwm.gov.in)

2.16 Climate

2.16.1 Micro Meteorological Characteristics

Meteorological factors have a direct bearing on the dispersion and dilution of pollutants/contaminants, discharged into the atmosphere with consequent impact on air Environment. Micro-meteorological properties of the atmosphere govern the concentration of pollutants and its variations with time and location with respect to their sources. Micro-meteorological measurements are therefore essential to fit the air quality observations in a dispersion model, with a view to arrive at the ground level concentration at various distances in down-wind direction for various pollutants. The nearest authoritative meteorological recording station is maintained by the Regional Meteorological Center at Madurai Airport. The basic meteorological parameters pertinent to the air pollution studies are those governing the transport and diffusion of the pollutants in the atmosphere and they are listed below:

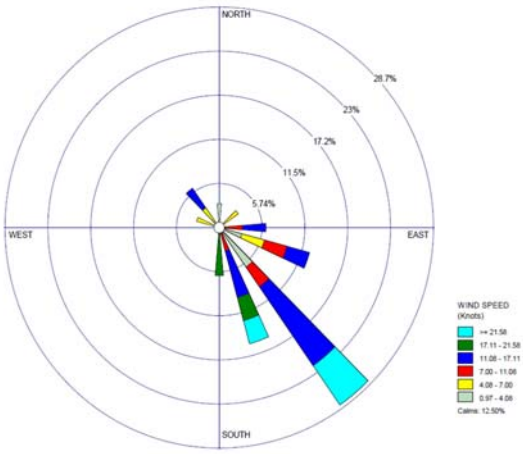
- Wind speed
- Wind direction
- Temperature
- Humidity and
- Rain fall

2.16.2 Methodology of Sampling:

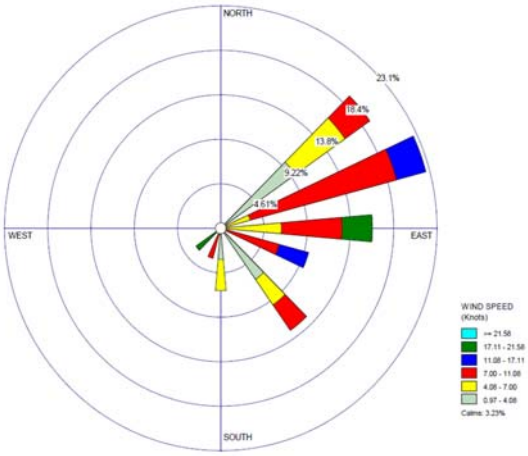
Micro-meteorological station was installed in the proposed site with the objective of recording wind direction and speed, Temperature, Humidity and Pressure. The data thus collected from the station represent the prevailing micro-meteorological aspects of core and buffer zone. Wind direction was observed using wind vanes and velocity, by using Anemometer at hourly intervals and data was plotted as wind roses. The maximum and minimum relative humidity for each sampling location was also recorded along with temperature by using wet and dry bulb thermometer. The rainfall was estimated using rain gauge.

2.16.3 Wind speed and direction

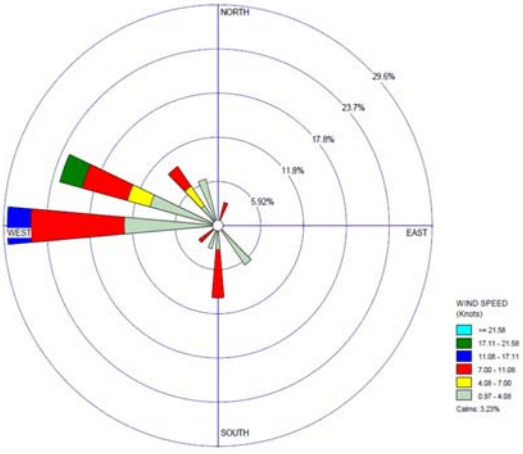
The observed temperature range in the area varied from 19º C to 42º C. The relative humidity normally varied between 40% and 98% while the minimum wind speed is 2 km per hour and the maximum wind speed is 40 km per hour. The predominant wind direction observed during the study period was in the North Eastern direction. Wind rose at site for the study period is depicted in Figure 16. Average annual rainfall in Madurai is 840 mm recorded in earlier years.



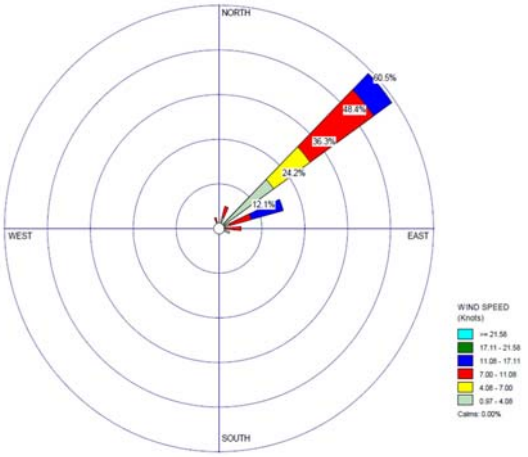
May 2019



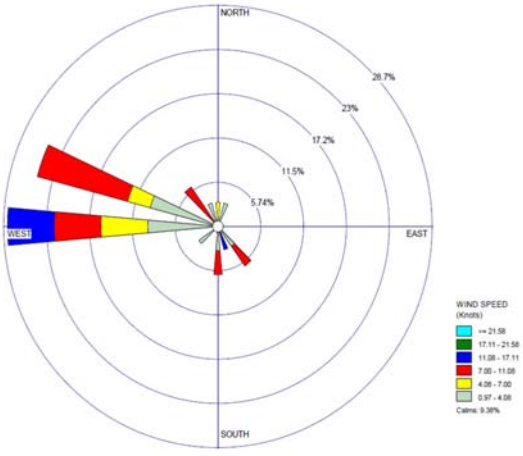
November 2019



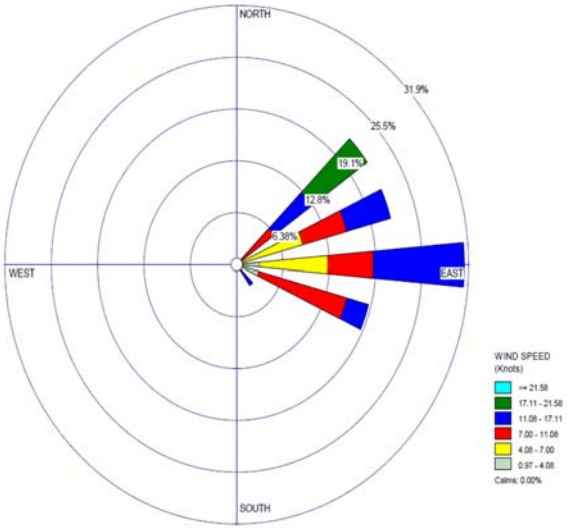
June 2019



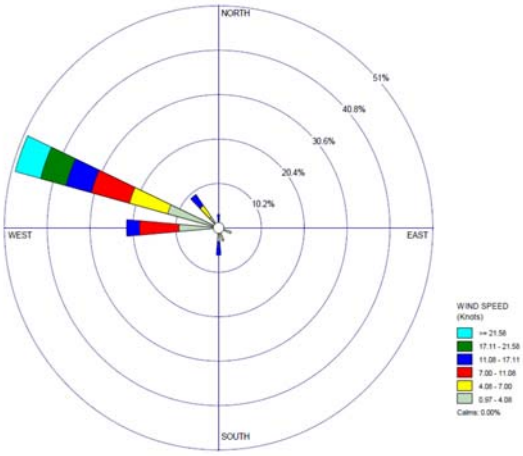
December 2019



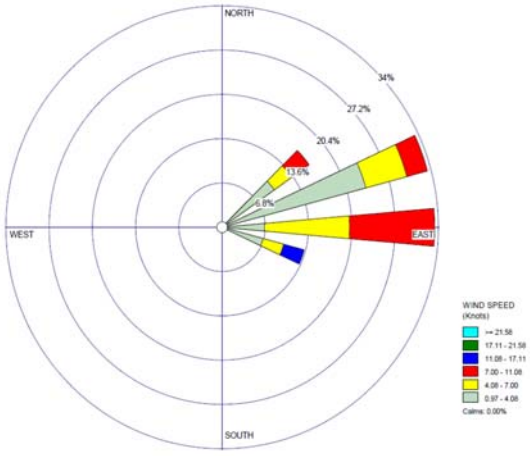
July 2019



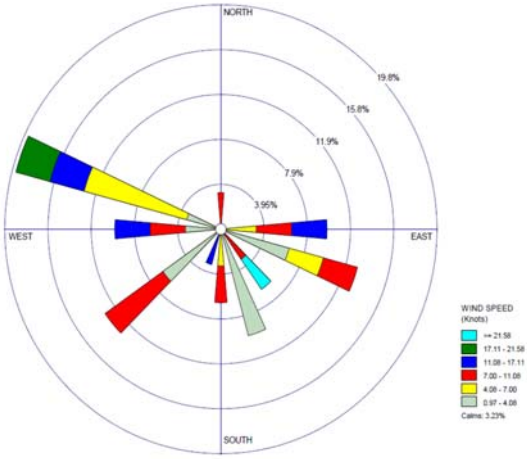
January 2020



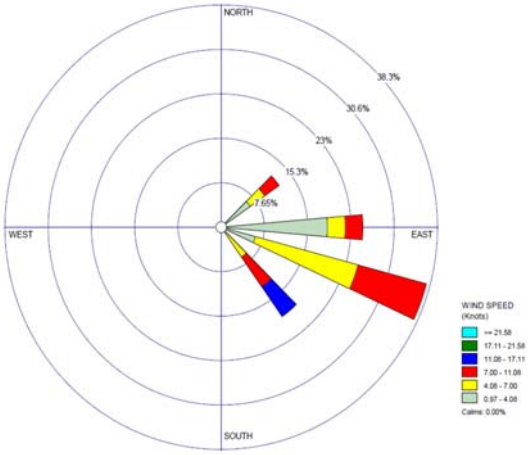
August 2019



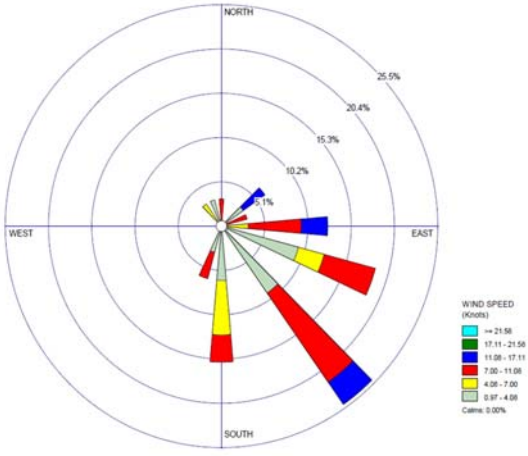
February 2020



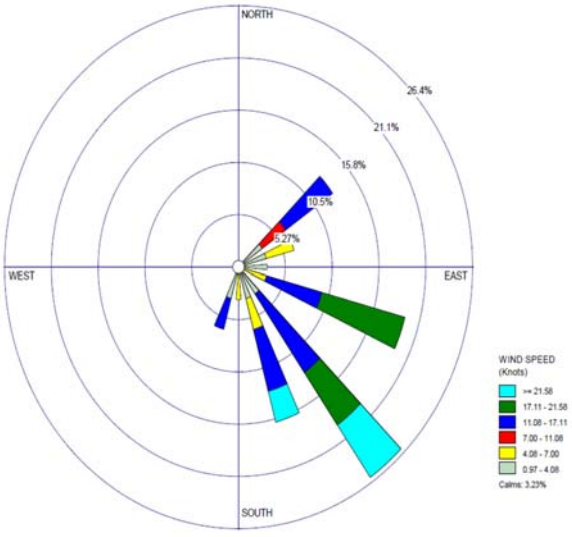
September 2019



March 2020



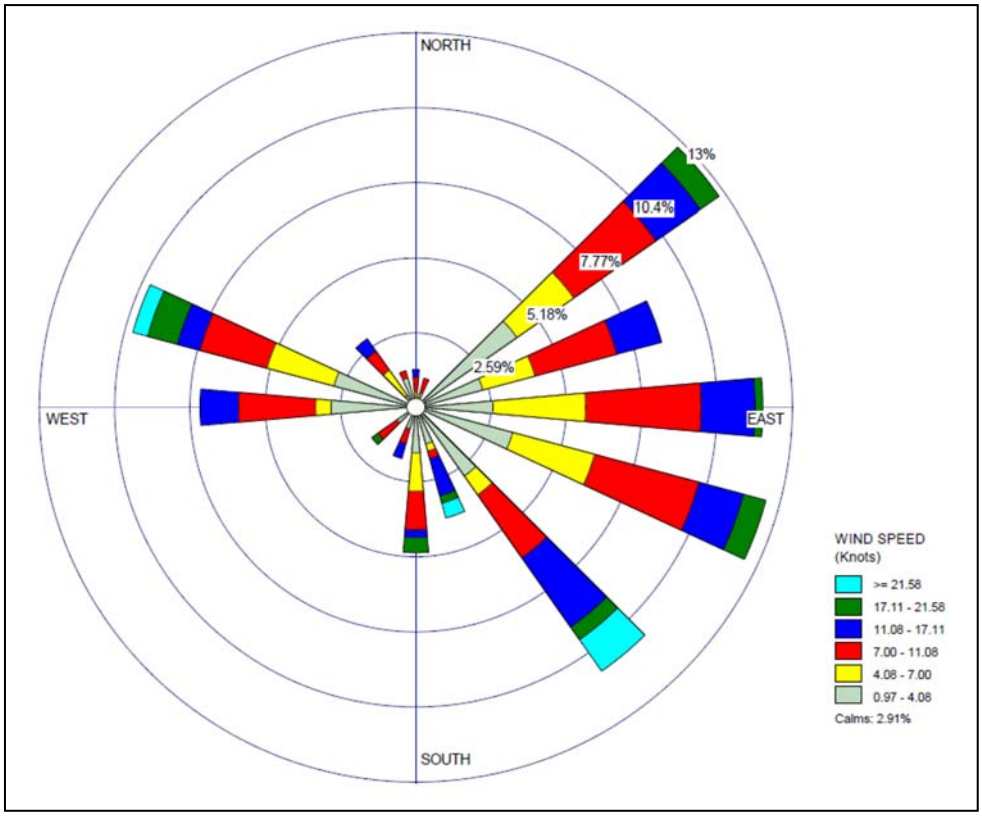
October 2019



April 2020

Figure 41 : Wind rose diagrams (month wise)

(Source: Data from Regional Meteorological Center at Madurai Airport, Software used: WRPLOT View developed by Lakes Environmental)



Source: Data from Regional Meteorological Center at Chennai for the station at Madurai Airport Software used : WRPLOT View developed by Lakes Environmental

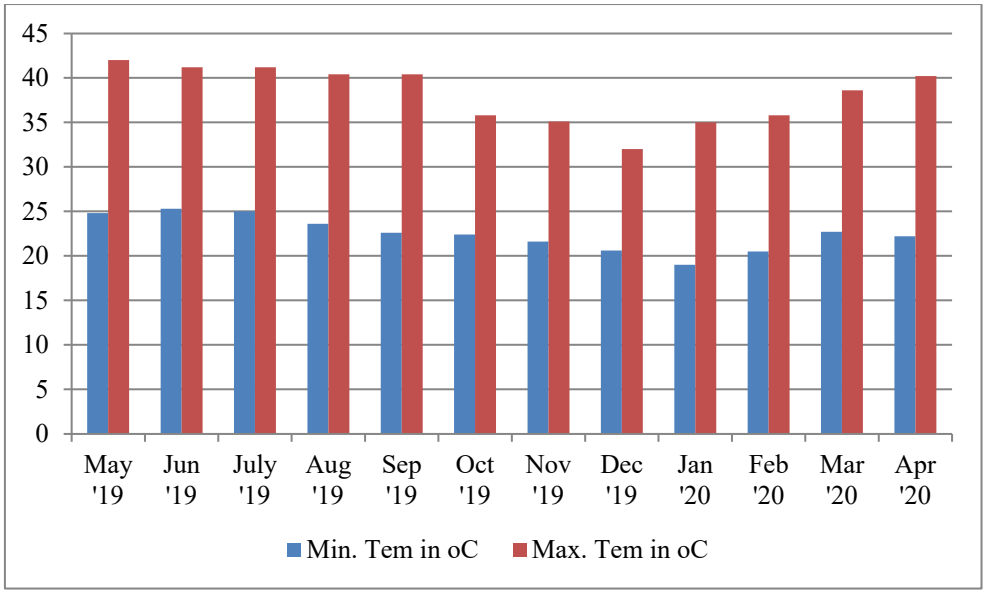
Figure 42 : Wind rose diagrams (2019-20 entire year)

2.16.4 Temperature

The observed temperature range in the area varied from minimum 19˚C to Maximum 42˚C.

Table 28 : Temperature (minimum and maximum)

Month	Min. Tem in ºC	Max. Tem in ºC
May '19	24.8	42
Jun '19	25.3	41.2
July '19	25	41.2
Aug '19	23.6	40.4
Sep '19	22.6	40.4
Oct '19	22.4	35.8
Nov '19	21.6	35.1
Dec '19	20.6	32
Jan '20	19	35
Feb '20	20.5	35.8
Mar '20	22.7	38.6
Apr '20	22.2	40.2



Source: Data from Regional Meteorological Center at Chennai for the station at Madurai Airport

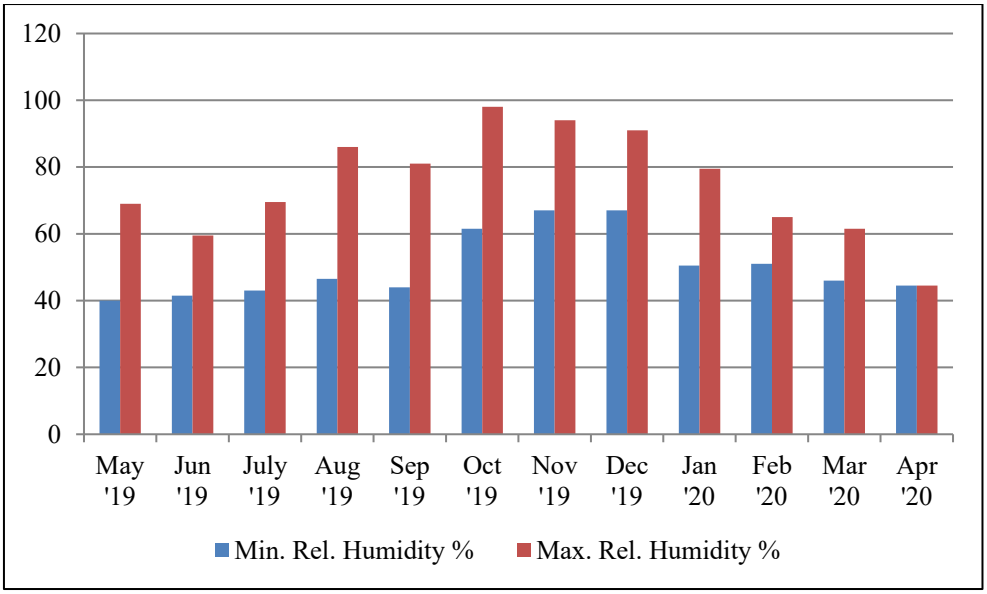
Figure 43 : Monthly min and max temperature (May 2019 – April 2020)

2.16.5 Relative Humidity

The relative humidity normally varied between 60% to 90% during the study period**.**

Table 29 : Relative Humidity (minimum and maximum)

Month	Min. Rel. Humidity (%)	Max. Rel. Humidity (%)
May '19	40	69
Jun '19	42	60
July '19	43	70
Aug '19	47	86
Sep '19	44	81
Oct '19	62	98
Nov '19	67	94
Dec '19	67	91
Jan '20	51	80
Feb '20	51	65
Mar '20	46	62
Apr '20	45	45



Source: Data from Regional Meteorological Center at Chennai for the station at Madurai Airport

Figure 44 : Monthly min and max Relative Humidity (May 2019 – April 2020)

2.16.6 Rainfall

Normal annual rainfall in Madurai district is 802.3mm recorded in earlier years (35 years average). The figure representing the monthly average rainfall and annual average rainfall for 35 years (1984 – 2018) is given below:

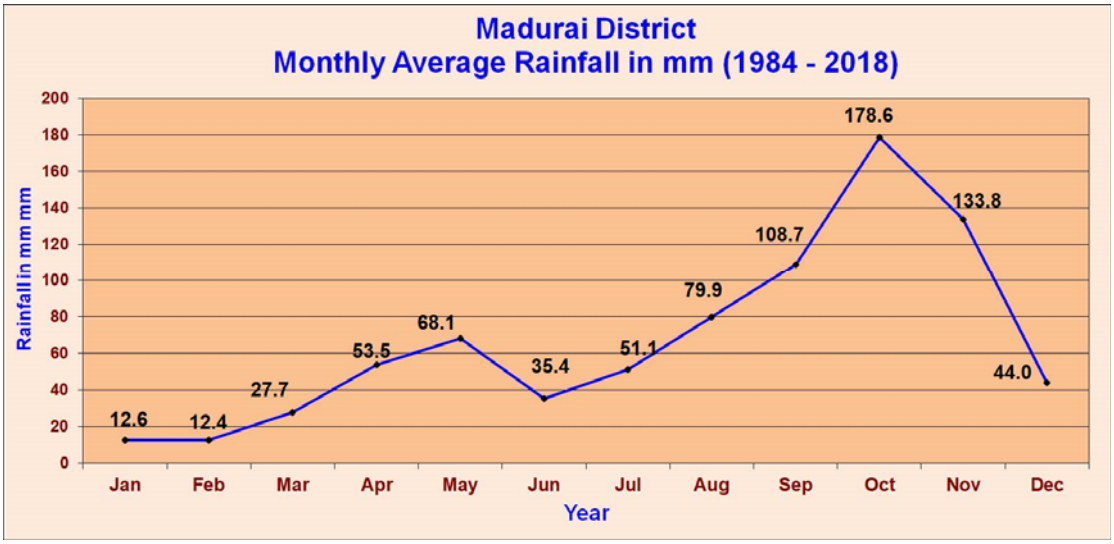


Figure 45 : Monthly Average rainfall for 35 years (1984 – 2018)

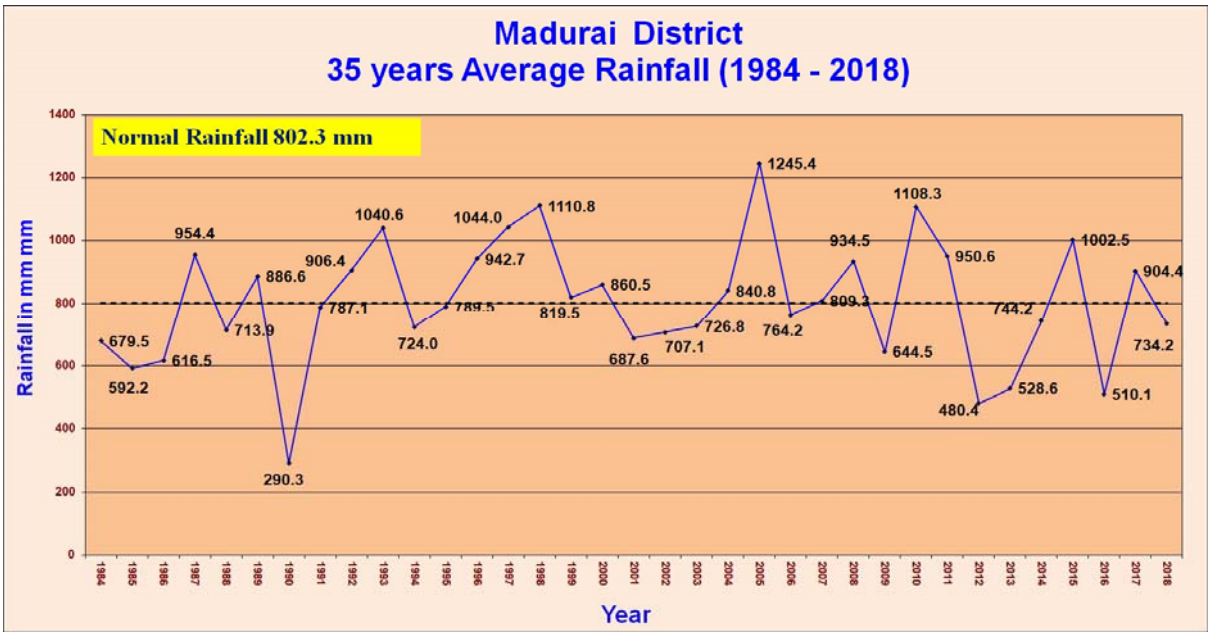


Figure 46 : Annual Average rainfall for 35 years (1984 – 2018)

CHAPTER 3

Institution and organization for environmental and social considerations in the host country

3 Institution and organization for environmental and social considerations in the host country

Requirements of prior Environmental Clearance (EC):-

Environmental assessment. The EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This decrees that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition)commences. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

Category A projects requires EC from the Central Ministry of Environment, Forests and Climate Change (MoEF&CC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEF&CC prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEF&CC considers the recommendation of the EAC and provides the EC if appropriate.

Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares ToR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

Environmental Clearance Process

Environment clearance is necessary for a few categories of construction projects and area development projects under the EIA Notification, 2006 as amended from time to time as per the following schedule given in Table 30.

The applicant will have to furnish, along with the application, in addition to Form 1 and the supplementary Form 1A, a copy of the conceptual plan. The details of the categories mentioned in the given schedule are as follows:

Table 30 : Schedule to EIA Notification, 2006

Project or Activity		Category with threshold limit - B Category	General Conditions
8.	**Building /Construction projects/Area Development projects and Townships**		
8(a)	Building and Construction projects	≥20000 sq.mtrs and <1,50,000 sq.mtrs. of built-up area#	"Any project or activity specified in Category 'B' will be treated as Category 'A' if located in whole or in part within 10 km from the boundary of: (i) Protected areas notified under the Wildlife
8(b)	Townships and Area Development projects.	Covering an area ≥ 50 ha and or built up area ≥1,50,000 sq .mtrs ++	(Protection) Act, 1972; (ii) Critically polluted areas as identified by the Central Pollution Control Board from time to time; (iii) Eco-sensitive areas as notified under section 3 of the Environment (Protection) Act, 1986, such as, Mahabaleswar Panchangi, Matheran, Pachmarhi, Dahanu, Doon Valley and (iv) inter-state boundaries and international boundaries. Provided that the requirement regarding distance of 10km of the inter-state boundaries can be reduced or completely done away with by an agreement between the respective states or U.Ts sharing the common boundary in the case the activity does not fall within 10 kilometers of the areas mentioned at item (i), (ii) and (iii) above
#(built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)			
++All projects under Item 8(b) shall be appraised as Category B1			

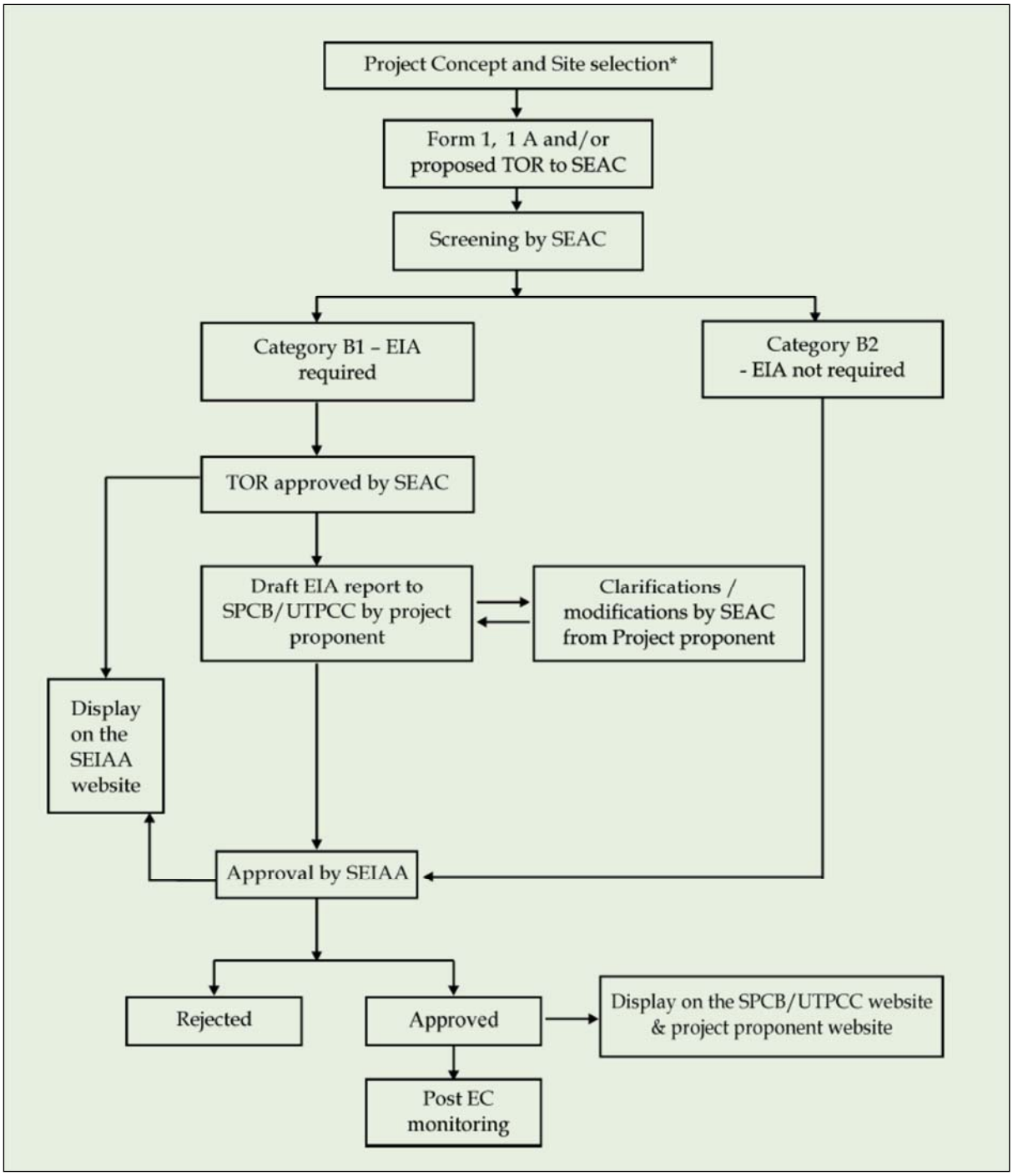


Figure 47 : Process Flow Chart for Prior Environmental Clearance - Category B Projects

Public Consultation

Public Consultation is exempted for the all Building or Construction projects and Townships and Area Development Projects under the EIA Notification, 2006.

Environmental Management Plan.

An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority

of the identified measures and actions will be commensurate with the project's impact and risks.

Applicable environmental regulations.

Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the project are shown in the table given below:

Table 31: Applicable Environmental Regulations

Law	Description	Requirement
Tamil Nadu Combined Development and Building Rules, 2019	As per act planning permission need to be obtained before commencement of the development work.	Prior to construction, Planning Permission and Building Permit should be obtained from Directorate of Town and Country Planning(DTCP)
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water. Control of water pollution is achieved through administering conditions imposed in consent issued under to this Act. All pollution potential activities will require Consent to Establish (CTE) from Tamil Nadu Pollution Control Board (TNPCB) before starting implementation and Consent to Operate (CTO) before commissioning.	Consent of Establish and subsequently 'Consent to Operate' from the Tamil Nadu Pollution Control Board (TNPCB) under Air & Water Acts and all the conditions laid down by TNPCB shall be complied by the Project Proponent. Application has to be submitted online at http://tnocmms.nic.in/OCMMS/
Air (Prevention and Control of Pollution) Act, 1981, amended 1987 and its Rules, 1982.	- Applicable for equipment and machinery's potential to emit air pollution (including but not limited to diesel generators and vehicles); - CTE and CTO from TNPCB; - Compliance to conditions and emissions standards stipulated in the CTE and CTO.	
Environment (Protection) Act,	Emissions and discharges from the facilities to be created or refurbished	To comply with applicable

Law	Description	Requirement
1986 and CPCB Environmental Standards.	or augmented shall comply with the notified standards	notified standards.
EIA Notification, 2006	Environment clearance is necessary for a few categories of construction projects and area development projects under the EIA Notification, 2006	To comply with the conditions laid down in Environmental Clearances. Application has to be submitted online at https://parivesh.nic.in/
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards with respect to noise for different areas/zones.	To comply with the noise standards.
Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Applicable Solid waste generated at proposed facilities shall be managed and disposed in accordance with the SWM Rules
Construction and Demolition Waste Management Rules, 2016	Rules to manage waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C&D waste as waste comprising of building materials, debris resulting from construction, re-modeling, repair and demolition of any civil structure.	Applicable Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement,	Labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works shall be complied.

Law	Description	Requirement
	and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	
The Wildlife Protection Act, 1972, amended in 2003 and 2006,.	Provides for protection and management of Protected Areas	Not Applicable. The project components are not located within or in the vicinity of the Sanctuary / National parks/ Protected areas. The nearest sensitive location is the Nilgiris Biosphere Reserve, which is about 15 - 20 km away from the subproject area.
The Forest Conservation Act, 1980 and its subsequent amendments	Necessitates obtaining clearance from the MoEF&CC for diversion of forest land for non-forest purposes.	Not Applicable. Acquisition/ diversion of forest land is not required for this project implementation. Hence obtaining clearance is not required.
The Bio-Medical Waste Management Rules, 2016	These rules shall apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, ayush hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs.	Applicable. Biomedical waste generated at proposed facilities shall be managed and disposed in accordance with the Bio-Medical Waste Management Rules, 2016
Hazardous And Other Wastes (Management and Transboundary Movement)	These rules shall apply to the management of hazardous and other wastes as specified in the Schedules of Hazardous And Other Wastes (Management and Transboundary Movement) Rules, 2016	Applicable. Hazardous waste generated at proposed facilities shall be managed and disposed in accordance with Hazardous And Other Wastes

Law	Description	Requirement
Rules, 2016		(Management and Transboundary Movement) Rules, 2016

Clearances / permissions to be obtained

Following Table shows the list of clearances/permissions required for project construction. This list indicative and the contractor should ascertain the requirements prior to start of the construction, and obtain all necessary clearances/permission prior to start of construction and operation.

Table 32 : Clearances and permissions required for Construction and Operation

S. No	Required permission	Statutory Authority	Statute under which Clearance is Required	Implementation	Supervision
1	Environmental Clearance	SEIAA, Govt. of Tamil Nadu	EIA Notification, 2006	Contractor &Project Management Unit (PMU)	Project Management Unit (PMU)
2	Consent to Establish (CTE) and Consent to Operate (CTO)	TNPCB	Water Act, 1974 and Air Act, 1981 &its amendments	Contractor &PMU	PMU
3	Permission for Tree Cutting	Department of Forest and District Collector	Clearances from the authorities as per the Tamil Nadu Timber Transit Rules, 1968 or latest.	PMU	PMU
4	Storage, handling and transport of hazardous materials – Hazardous Waste Authorization	TNPCB	Hazardous And Other Wastes (Management And Transboundary Movement) Rules, 2016	Contractor	PMU

S. No	Required permission	Statutory Authority	Statute under which Clearance is Required	Implementation	Supervision
5	Groundwater Extraction NOC	Public Works Department	(Groundwater) Tamil Nadu Groundwater Development and Management Act 2000	Contractor	PMU
6	NOC for Height Clearance	Airport Authority of India	Ministry of Civil Aviation order GSR751 (E) for safe and Regular Aircraft operation	Contractor	PMU
7	NOC from Fire Safety Department.	Tamil Nadu Fire and Rescue Services Department	NOC is required under Fire Service point of view	Contractor	PMU
8	Biomedical Waste Authorization	TNPCB	The Bio-Medical Waste Management Rules, 2016	PMU	PMU

Major Labor Laws Applicable to be followed for the engagement of construction workers:

i. Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

ii. Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

iii. Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.

iv. Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

v. Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

vi. Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.

vii. Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

viii. Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.

ix. Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

x. Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

xi. Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

xii. Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

xiii. Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

xiv. Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

xv. The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

Gap analysis between national laws and JICA guidelines

This report is prepared based on the JICA Guidelines for Environmental and Social considerations 2010 and the relevant laws applicable to the proposed project are discussed in this chapter as earlier. Before implementing the project, the gap analysis between the JICA Guidelines and relevant laws should be identified and the gaps shall be addressed as applicable. The below table gives the summary of the gaps identified and the action plan to be taken as follows:

Table 33: Gap Analysis between Indian Regulation and JICA Guideline on EIA study

JICA Guidelines for Environmental and Social considerations 2010		**Relevant law in India**	**Gap between JICA Guidelines and Government Law/ Actions to be taken**
Underlying principles	- Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and incorporated into the project plan.	**LAW:** 1. S.O. 1533 (E) dated the 14th September 2006 2. Compendium of Gazette Notifications, OMs under EIA Notification 2006 up to 7th October ,2014 3. S.O. 2600 (E) dated the 9thOctober, 2014 4. S.O. 3252 (E) dated the 22nd December 2014 5. S.O. 382 (E) dated the 3rd February 2015 6. S.O. 811 (E) dated the 23rd March 2015 7. S.O. 996 (E) dated the 10th April 2015 8. S.O. 1142 (E) dated the 17th April 2015 9. S.O. 1141 (E) dated the 29th April 2015 10. S.O. 1834 (E) dated the 6th July 2015 11. S.O. 147 (E) dated the 15th January 2016 12. S.O. 246 (E) dated the 25th January 2016 **Description** Project Introduction & Brief. Baseline data collection (Primary & Secondary). Impact analysis & Mitigation Measures. Analysis of alternatives and others. Environment Management Plan preparation with	Timing of EIA study assumed by JICA Guidelines is during basic design stage; whereas, EIA study for the projects categorized as area development should be conducted after the detailed design phase as per Indian regulation. EIA survey should be conducted during preparatory survey and the results should be reflected and incorporated in the following phases of project implementation

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
		implementation. **Responsibility:** State Environment Impact Assessment Authority (SEIAA).	
Disclosure of information	- EIA reports (which may be referred to differently in different systems) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to residents, written materials must be provided in a language and form understandable to them; - EIA reports are required to be made available to the residents of the country in which the project is to be implemented. The EIA	**As per EIA Notification, 2006** • The Applicant shall make a request through a simple letter to the Member Secretary of the SPCB or Union Territory Pollution Control Committee, in whose jurisdiction the project is located, to arrange the public hearing within the prescribed statutory period. In case the project site is extending beyond a State or Union Territory, the public hearing is mandated in each State or Union Territory in which the project is sited, and the Applicant shall make separate requests to each concerned SPCB or UTPCC for holding the public hearing as per this procedure. • The Applicant shall enclose with the letter of request, at least 10 hard copies and an equivalent number of soft (electronic) copies of the draft **EIA Report with the generic structure given in Appendix III including**	**The project proposal attracts EIA Notification, 2006 as amended and falls under schedule 8(b) "Townships and Area Development projects" of EIA Notification.** Therefore, approved EIA report will be publicized via state government's HP. In addition, the project summary of the EIA report should be made available in the local/regional language as well as in English language to the concerned project authorities. It must be also available in selected offices or public libraries or panchayats etc.

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
	reports are always required to be available for perusal by project stakeholders such as local residents and copying must be permitted;	**the Summary Environment Impact Assessment report in English and in the local language, prepared strictly in accordance with the Terms of Reference communicated after Scoping (Stage-2)**. Simultaneously the applicant shall arrange to forward copies, one hard and one soft, of the above draft EIA Report along with the Summary EIA report to the Ministry of Environment and Forests and to the following authorities or offices, within whose jurisdiction the project will be located: ✓ District Magistrate/s ✓ Zila Parishad or Municipal Corporation/Gram Panchayat ✓ District Industries Office ✓ Concerned Regional Office of the Ministry of Environment and Forests • On receiving the draft Environmental Impact Assessment report, the abovementioned authorities except the MoEF&CC, shall arrange to widely publicize it within their respective jurisdictions requesting the interested persons to send their comments to	

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
		the concerned regulatory authorities. They shall also make available the draft EIA Report for inspection electronically or otherwise to the public during normal office hours till the Public Hearing is over. The Ministry of Environment and Forests shall promptly display the Summary of the draft Environmental Impact Assessment report on its website, and also make the full draft EIA available for reference at a notified place during normal office hours in the Ministry at Delhi. • The SPCB or UTPCC concerned shall also make similar arrangements for giving publicity about the project within the State/Union Territory and make available the Summary of the draft Environmental Impact Assessment report (Appendix III A) **for inspection in select offices or public libraries or panchayats etc.** They shall also additionally make available a copy of the draft Environmental Impact Assessment report to the above **five authorities/offices viz, Ministry of Environment and Forests,**	

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
		District Magistrate etc.	
Social acceptability	- For projects with a potentially large environmental impact, enough consultations with local stakeholders, such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into the contents of project plans. - In preparing EIA reports, consultations with stakeholders, such as residents, must take place after sufficient information has been disclosed. Records of such consultations must	• The Member-Secretary of the concerned SPCB or UTPCC shall finalize the date, time and exact venue for the conduct of public hearing within 7(seven) days of the date of receipt of the draft Environmental Impact Assessment report from the project proponent and advertise the same in one major National Daily and one Regional vernacular Daily. A minimum notice period of 30(thirty) days shall be provided to the public for furnishing their responses; • The advertisement shall also inform the public about the places or offices where the public could access the draft Environmental Impact Assessment report and the Summary Environmental Impact Assessment report before the public hearing. • No postponement of the date, time, venue of the public hearing shall be undertaken, unless some untoward emergency occurs and only on the recommendation of the concerned District Magistrate the postponement shall be notified	**As per above, the project categorized in 8(b) is exempted from public consultation process as per EIA Notification, 2006.** Still as compliance to the JICA Guidelines, public consultation should be conducted during preparatory survey and the comments should be incorporated into planning and implementation of the project. *Considering the situation related to COVID-19 at the time of preparatory survey where mass gatherings are not allowed, the brief summary of project will be disclosed to stakeholders and the comments shall be received via online mode.

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
	be prepared; - Consultations with relevant stakeholders, such as residents, should take place if necessary, throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared;	to the public through the same National and Regional vernacular dailies and prominently displayed at all the identified offices by the concerned SPCB or Union Territory Pollution Control Committee; • In the above exceptional circumstances fresh date, time and venue for the public consultation shall be decided by the Member –Secretary of the concerned SPCB or UTPCC only in consultation with the District Magistrate and notified afresh as per procedure under.	
Scope of impacts to be assessed	- The impacts to be assessed about environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage,	The environmental clearance process for new projects will comprise of a maximum of four stages, all of which may not apply to cases as set forth below in this notification. These four stages in sequential order are: - Stage (1) Screening (Only for Category 'B' projects and activities) Stage (2) Scoping Stage (3) Public Consultation	No major Gap.

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
	climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest,	Stage (4) Appraisal **For Social Consultation** ✓ Land Acquisition Act 1894 (Amended in 1984) and The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. ✓ The Provision of the Panchayats (Extension to the Scheduled Areas) Act, 1996. ✓ The Madhya Pradesh Panchayat Raj Act, 1993. **For Environment Survey** ✓ Environmental Impact Assessment (EIA) Notification, 2006 and amendment in 2016. ✓ Forests (Conservation) Act, 1980 and Rules 1981 as amended 2004. ✓ Wildlife (Protection) Act 1972. ✓ Hazardous Waste (Management, Handling and Trans-boundary Movement) rules, 2008 as amended in 2016 under EPA, 1986 (HWM Rules, 2008). ✓ The Air (Prevention and Control of Pollution) Act, 1981 Including Rules 1982 and 1983. ✓ The Noise Pollution (Regulation and	

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
	infectious diseases such as HIV/AIDS, and working conditions including occupational safety. - In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	Control) Rules, 2000 and the Noise Pollution (Regulation and Control) Amendment Rules, 2010. ✓ Water Prevention and Control of (Pollution) Act, 1974 including Rules, 1975 (as amended up to 1988). ✓ The Water Prevention and Control of Pollution), Cess Act, 1977 including Rules 1978 and 1991. ✓ The Bio-Medical Waste Management Rules, 2016	
Monitoring	- Project proponents etc. should make efforts to make the results of the monitoring	As per EIA notification, 2006, ✓ (i) It shall be mandatory for the project management to submit half-yearly	There are some gaps because of there is no-mention for the solution of inadequate

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
	process available to local project stakeholders. - When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents etc. should make efforts to reach an agreement on procedures to be adopted with a view to resolving problems.	compliance reports in respect of the stipulated prior environmental clearance terms and conditions in hard and soft copies to the regulatory authority concerned, on 1st June and 1st December of each calendar year. ✓ (ii) All such compliance reports submitted by the project management shall be public documents. Copies of the same shall be given to any person on application to the concerned regulatory authority. The latest such compliance report shall also be displayed on the web site of the concerned regulatory authority. Additionally, the MoEF&CC outlined through its office memorandum vide letter No.J-11013/41/2006-IA.II(I), Government of India, Ministry of Environment & Forests dated 12.12.2012 that "the State Government concerned will need to initiate credible action on the violation by invoking powers under Section 19 of the Environment (Protection) Act, 1986 for taking necessary legal action under Section 15 of the Act for the period for which the violation has	environmental and social consideration. **Action to be taken** Project proponent should consider reporting the result of self-conducted monitoring and uploading the same to the website and cover the issues with the solutions in the Environmental Management Plan.

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
		taken place". As per EIA notification No. S.O.804 (E) dated 14th March 2017; all the projects which have started construction work, or have undertaken expansion, modernization and change in product-mix without obtaining the prior Environmental Clearance will be treated as violation.	
Ecosystem and biota	- Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests.	**Forests (Conservation) Act, 1980 and Rules 1981 as amended 2004.** The Forest Conservation Act (FCA) was adopted in 1980 to protect and conserve forests. The Act restricts the powers of the State in respect of de-reservation of forests and the use of forestlands for non-forest purposes. An advisory committee has been created to oversee the implementation of the statute. The FCA is relevant for the power sector for the siting guidelines for Wind Energy Project, and for passage of transmission through forest areas, since it would involve use of forestland for "non-forest" purposes. According to Section 2 of the Act "notwithstanding anything contained in any other law for the time being in force in a State, no	No major Gap.

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
		State Government, or other authority shall, except with the prior approval of the Central Government, make any order directing: ✓ De-reservation of a reserved forest ✓ Use any forest land for any non -forest purpose ✓ Assign any forest land to any private person or entity not controlled by the Government ✓ Clear any forest land of naturally grown trees for the purpose of using it for reforestation **Wildlife (Protection) Act 1972** ✓ The Act provides for the protection of wild animals, birds and plants; and for matters connected therewith or ancillary or incidental thereto. Birds are covered under this Act making it illegal to catch, keep, kill, buy / sell birds or damage their nests. All indigenous bird species are covered under this Act including peacocks. ✓ The application of the Order of the Hon'ble Supreme Court in WP 460 of 2004 dated 04.12.2006 in the matter of Goa Foundation	

JICA Guidelines for Environmental and Social considerations 2010		Relevant law in India	Gap between JICA Guidelines and Government Law/ Actions to be taken
		v. Union of India and other wherein the Hon'ble Supreme Court has directed that all projects which require environmental clearance and are located within the distance of 10km of National Park and Sanctuaries must be placed before the standing Committee of the National Board for Wildlife constituted under the Wildlife (Protection) Act, 1972.	

CHAPTER 4
Comparison of the alternative measures

4 Comparison of the alternative measures (Including "Zero Option")

4.1 Consideration of Alternative Location

According to an interview by Tamil Nadu state government, there was no alternative site considered for the project development due to the unique characteristics of the project. First of all, to accommodate hospital facilities and medical institute, a large land area is required for the site. Comparing other established AIIMS hospitals, the area ranging from 100 to 200 Acres (equivalent to 40 and 80 ha respectively) is required for the project site development. Accessibility to townships is another important factor in selecting the site for proposed project. In addition to these, public land ownership was preferred to avoid involuntary resettlements. Considering all these factors the proposed project site was the best option for the project proponent.

4.2 Building Materials

The conventional practice of clay, brick consumes large quantity of energy in terms of coal and other fuels which are primarily non-renewable and highly polluting. Water requirements of building industry are also very high. Steel which is used in the construction process is manufactured by non-renewable resource. Normally conventional materials used for construction are non-renewable sources.

Use of alternative technologies for each component of the buildings of envelope, superstructure, finishes and the road and surrounding areas are discussed in detail. Some of proposed building materials are given below:

- Brick and block products with waste and recycled contents such as fly ash (waste from coal burning plants), blast furnace slag, waste wood fiber etc.
- Fly ash based lightweight aerated concrete blocks can be used for walls.
- Perforated bricks can be used for wall structures.
- Use of precast walls, roof, staircase, etc.
- Use of renewable timber for doors and windows
- Use of steel manufactures from recycled content
- Saw dust based doors and window frames
- Ferro-cement shutters, PVC doors and windows, Rice husk boards, Natural fiber-reinforced polymer composite door panels
- Bamboo based products, bamboo strips boards.
- Alternatives for finishes include Fly ash, Ceramic tiles, Terrazzo floors

The use of the alternatives for building materials will help reduce the use of non-renewable resources and impact on natural resources.

Direct and Indirect Environmental Impact:

- Integrity of site and vegetation during construction
- Use of integrated pest management

- Use of native plants for landscaping
- Minimization of disturbance to the watershed and additional non-point-source pollution
- Effect of materials choice on resource depletion and air and water pollution
- Amount of energy used to produce building materials

Resource Conservation and Recycling

- Use of recyclable products and those with recycled material content
- Reuse of building components, equipment, and furnishings
- Minimization of construction waste and demolition debris through reuse and recycling
- Easy access to recycling facilities for building occupants
- Minimization of sanitary waste through reuse of grey water and water-saving devices
- Use of rainwater for greenbelt
- Water conservation in building operations
- Use of alternative wastewater treatment methods

Indoor Environmental Quality:

- Volatile organic compound content of building materials
- Minimization of opportunity for microbial growth
- Chemical content and volatility of maintenance and cleaning materials
- Minimization of business-machine and occupant pollution sources
- Adequate acoustic control
- Access to daylight and public amenities

Community issues:

- Access to site by mass transit and pedestrian or bicycle paths
- Attention to culture and history of community
- Climatic characteristics as they affect design of building or building materials
- Local incentives, policies, regulations that promote green design
- Infrastructure in community to handle demolition-waste recycling
- Regional availability of environmental products and expertise

4.3 Domestic Waste Water Management Alternatives

Five locally available technologies are discussed below as alternatives to waste water treatment:-

Alternative one: Waste water treatment plant

This involves the construction of a treatment plant that will enable the recycling of the waste water from the project activities to reusable standards and utilized within the site in activities such as greenbelt and flushing of the toilets. It is usually expensive to construct and maintain,

but it is the most reliable, efficient and cost effective in the long term. This is the most preferred option for such project because of its benefits.

Alternative two: Use of stabilization ponds/lagoons

This refers to the use of a series of ponds/lagoons that allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for greenbelt development. However, they occupy a lot of space but are beneficial costwise. No chemicals are used. Heavy metals sink and decomposition processes take place. They are usually a nuisance to the public because of smell from the lagoons/ponds. This option is not preferable in the area because the required space is not available due to the site area constraints.

Alternative Three: Use of Constructed/Artificial wetland

This is one of the powerful tools/methods used in improving the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins. The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant species on the site will also be required to avoid weed biological behavioral problems. Hence it is not the best alternative for this kind of project.

Alternative Four: Use of septic tanks

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. It is expensive to construct and regularly empting in large tanks, wherein the commercial development project is fully functional is not a viable alternative since treated water has to be re-used for flushing, greenbelt, HVAC etc.

In conclusion, the recommended course of action for this Project would be establishment of Sewage Treatment Plant adopting Sequencing Batch Reactor technology and utilization of treated water for flushing, gardening and HVAC within the campus.

4.4 Effluent Treatment

The effluents from the project activity consist of infectious stream from the OT, Labs and Laundry.

Alternative one: Dedicated Treatment Plant

The separate pipelines for the effluent shall be designed and collected. The dedicated treatment plant consist of Neutralization Tank, Disinfection Tank, Clarifier Tank, Pressure Sand Filter, Activated Carbon Filter, Ultra Filtration shall be installed.

Alternative two: Combined Treatment with Sewage

The effluent generated can be disinfected at source using 5% hypochlorite solution with the contact period of minimum 15 minutes. The disinfected effluent shall be mixed with the Sewage Treatment Plant for further treatment and disposal.

Considering the long term operation of the campus, the proponent shall install the dedicated treatment plant for the treatment of effluent.

4.5 Solid Waste Management

The municipal solid waste will comprise of paper, cardboards, kitchen waste (vegetable peals, food waste, meat, bones, etc.) metal, glass, cloth, plastic, E-Waste (used electric waste), Hazardous waste (Used oil, oil soaked cotton etc.).

The project proponent will take necessary measures to minimize the usage of plastics. The facilities-in-charge of the respective buildings will be mandated to source segregate solid waste into wet / Organic waste, Dry / Inorganic Waste, Metal, Glass, E-waste as per the Solid Waste Management Rules (SWM), 2016 and amended thereafter. The segregated solid waste will be manually collected and conveyed to the Waste Management / Processing area. The Inorganic recyclable solid waste will be disposed to local recycling agencies and the wet organic waste will be converted to compost / manure using in-house treatment.

Alternative one: Organic Waste Converter (OWC) Machine

OWC Process

- The waste is fed into the machine (according to its capacity) after draining the excess water from the food waste.
- A suitable culture and absorbent is mixed with the food waste and the entire waste is crushed and uniformly mixed for 10 - 15 minutes.
- The above process is repeated till the entire food waste is digested in the converter.
- Organic waste is converted into homogenized crushed matter which is odor free
- The homogenized odor free output is taken to curing system for stabilization, which takes about 2 weeks.
- The end product i.e., organic manure is a valuable source of bio-manure for Kitchen garden and landscaping needs.
- The organic waste helps in a faster bio-conversion of waste into organic manure or fuel pellets.

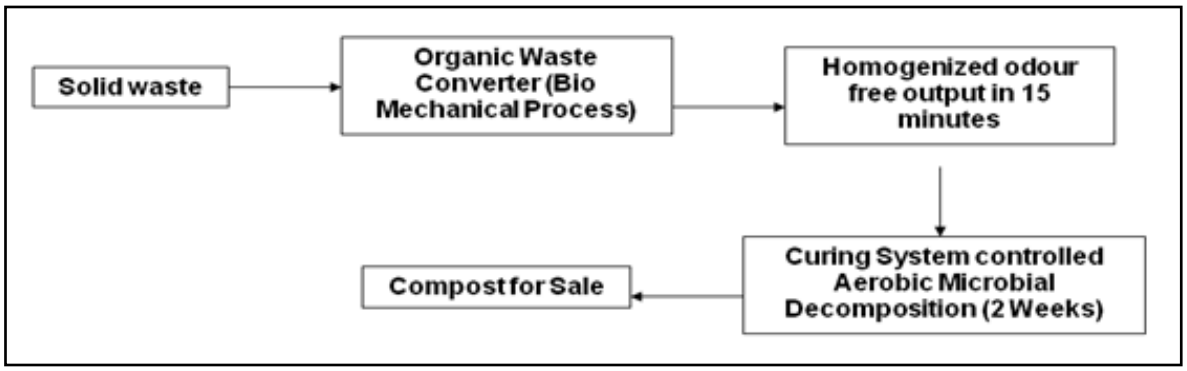


Figure 48 : Flow chart of OWC Operation

Alternative two: Installation of Biogas Plants

The following should be maintained towards achieving the continuous operation of biogas plant:

1. Maintain constant feed rate and composition
2. Avoid overfeeding and abrupt changes
3. Avoid foaming, don´t: add a substrate with a low pH value, add substrate with a considerably high protein content,
4. Mix as much as necessary and as little as possible: Keep in mind: all in = all out
5. Maintain continuous mixing
6. Choose an appropriate temperature
7. Keep the temperature constant

The biodegradable solid waste generation from the campus will be more than 1.0 T/day and the operation of campus will be throughout the year. Considering the quantum of generation the proponent shall install bio-gas plant for the treatment of bio-degradable solid waste.

CHAPTER 5
Scoping and TOR for survey of environmental and social considerations

5 Scoping and TOR for survey of environmental and social considerations

The potential impacts result from the Project are preliminarily presented and analyzed in this Section with respect to the following aspects:

- Pollution control measures;
- Natural environment;
- Social-environment; and
- Others.

The impacts were evaluated the following rating scale and criteria;

1) D -: Direct Negative Impact D +: Direct Positive Impact
2) ID -: Indirect Negative Impact ID +: Indirect Positive Impact
3) NI: No Impacts or Impacts are negligible, no further study required

The result of scoping for environmental and social impact assessment is shown in the following table. Scoping was carried out for two stages (i.e. Construction Phase (CP) and Operation Phase (OP).

Table 34 : Scoping and TOR for survey or environmental and social considerations

Category		Item	Evaluation		Reason for evaluation
			CP	OP	
Pollution control measures	1	Air quality	D -	D -	**CP:**Temporary air pollution due to earth excavation, building construction and equipment operation is expected. **OP:**The increase of traffic might cause air pollution, while the paved road will decrease dust. Also, the operation of DG sets will increase the emissions. But, the operation of DG sets is only during the power failure.
	2	Water quality	D -	D -	**CP:**Water demand will be for dust settlement, consolidation,

Category		Item	Evaluation		Reason for evaluation
			CP	OP	
					compaction and curing. The water used for construction shall satisfy the IS 456:2000. **OP:**The fresh water demand during the operation phase of the project shall satisfy the IS 10500-2012. The treated water from the STP /ETP shall satisfy the discharge standard prescribed by TNPCB.
	3	Waste	ID +	D -	**CP:**Construction waste usually comprises of concrete, wood products, asphalt shingles, brick and clay tile, steel. According to the Technology Information, Forecasting and Assessment Council's, or TIFAC's, thumb rule) a new construction generates 40-60 kg of C&D waste per sq m, then taking an average of 50 kg per sq m. **OP:**The domestic waste will comprises of biodegradable and non-biodegradable solid waste. As per manual published by Central Public Health and Environmental Engineering Organisation, Ministry Of Urban Development, the domestic waste will be 0.3-0.6 kg/capita/day. The biomedical waste will be generated from the inpatient and out patient departments.
	4	Soil contamination	D -	NI	**CP:** The contaminated water may percolate into the soil resulting in soil contamination. **OP:**There is no major toxic discharge towards soil contamination
	5	Noise and vibrations	ID -	ID -	**CP:**The movement and usage of machineries for construction will result in increase of noise levels. **OP:**There will be minimal increase in noise level due to movement of vehicles.

Category		Item	Evaluation		Reason for evaluation
			CP	OP	
	6	Ground subsidence	D	NI	**CP:**Excavation for basements and foundations during the construction may result in ground subsidence. **OP:**Nil
	7	Offensive odor	D	D	**CP:**The paints and varnishes used during the building finishing i.e. painting work may result in offensive odor **OP:** Inefficient Operation and maintenance of STP, ETP, and Solid waste management facilities will create the offensive odor.
	8	Bottom sediment	NI	NI	**CP / OP:** There is no water body in and around the project site. Nearest water body (lake) located from the project site is located at a distance of 4.66 km in southern direction.
Natural environment	9	Protected area	NI	NI	**CP/ OP:**There are no protected areas situated in and around the project site. Nearest protected area (known as Grizzled Giant Squirrel Wildlife Sanctuary) present in Virudhunagar at a distance of 65 Km from the project area
	10	Flora/ Fauna & Biodiversity	D -	D +	**CP:**The ground shrubs will be removed and temporary displacement of flora and fauna. However, there are no endangered species observed in the project site. **OP:**Plantation of native species trees within project area will attract flora and fauna.
	11	Hydrology	NI	NI	**CP:**Increase in built-up area will results in low permeability which affects the existing hydrology. **OP:**The implementation of rainwater harvesting will improve the ground water table and thus change in hydrology will be envisaged.
	12	Topography and	D	D	**CP:** Cutting and filling will result in change in ground levels (altitude)

Category		Item	Evaluation		Reason for evaluation
			CP	OP	
		geology			**OP:**Increase in paved areas and level rising will change the existing drainage pattern.
Social environment	13	Involuntary resettlement	NI	NI	**CP&OP:**The project activity does not have involuntary resettleent
	14	Poverty	NI	NI	**CP, OP:** There are no low income / economically weaker section people in the vicinity of project area.
	15	Ethnic minority and indigenous people	NI	NI	**CP, OP:**There are no minority / tribal people in the vicinity of project area.
	16	Local economy (Employment and livelihood)	ID+	ID+	**CP:**The local people (skilled and unskilled) will be employed for the construction activity. **OP:**Creation of permanent employment and establishment of individual commercial establishments around campus will lead to economic development.
	17	Land use and utilization of local resources	ID	ID	**CP:**Changes in present land use from vacant site to infrastructure development. The surrounding of project is majorly agricultural land and after the development of project the change in land use may occur. **OP:** Resources such as materials and man power shall be deployed locally.
	18	Water usage	D	D	**CP:** The water demand for the construction will be higher quantity during the compaction, consolidation and curing process. **OP:** The fresh water usage will be for domestic purposes.
	19	Existing social infrastructure and service	ID	ID	**CP/OP:** The infrastructure such as existing connectivity roads, drainage, water supply, waste disposal (domestic, biomedical waste, hazardous waste), power supply will be required for the project project.

Category		Item	Evaluation		Reason for evaluation
			CP	OP	
	20	Social institutions such as social infrastructure and local decision-making institutions	NI	NI	**CP/OP:** The project will have positive impact on social infrastructures development.
	21	Maldistribution of damage and benefit	NI	NI	**CP/OP:** The project may not cause imbalanced distribution of benefits and damages in the surrounding area considering characteristics of the project.
	22	Local conflict of interest	NI	NI	**CP /OP:**Local public needs the project to be implemented at the earliest.
	23	Cultural heritage	NI	NI	**CP /OP:**There is no cultural heritage in and around the project site.
	24	Landscape	D -	D+	**CP:**Existing ground shrubs will be removed. The existing landscape will be modified to superstructure/buildings, open area, roads etc. **OP:**Development of greenbelt will attract flora and fauna..
	25	Gender	NI	NI	**CP/OP:-** From the survey conducted within the study area, it was understood that no impact on gender is expected to cause by the project. There is no loss of livelihood and increase in the job opportunities for the local people is anticipated.
	26	Children's rights	NI	NI	**CP:** Child labours will not be employed for any kind of work and it will be strictly followed by the contractors. **OP:** No activity is planned that will violate the children's rights.
	27	Infectious disease and HIV/AIDS	ID -	ID -	**CP:** Inflow of construction workers may increase the risks on communicable diseases. Periodically medical testing camp and health awareness programs will be conducted for all workers. **OP:** Poor sanitation will cause diseases such as cholera, diarrhoea,

Category		Item	Evaluation		Reason for evaluation
			CP	OP	
					dysentery, hepatitis A etc., Inadequate biomedical waste management will cause adverse effect to health and environment.
	28	Occupational Health (including work safety)	ID -	D	**CP:** Construction risk and hazard will occur for the employees engaged in the activity. Leak burst and explosion of petroleum pipeline may occur. **OP:** Safety to the paramedical staff and safety on petroleum pipeline may be required.
Others	29	Accident	ID -	ID	CP: Impact of construction vehicles to the local community is predicted. Construction activity risk is predicted **OP:** Major accidents including natural disasters that could happen are fire, electrical accident, petroleum pipeline leak, and earthquake.
	30	Cross-border impact, climate change	ID -	ID -	**CP:** Emission of greenhouse gases (GHGs) due to construction is expected resulting in micro climatic changes. **OP:** Emission of GHGs is expected due to operation of the air-conditioning system and movement of vehicles associated with operation of the hospital.

CHAPTER 6
Survey result of environmental and social considerations

6 Survey Result of environmental and social considerations

6.1 Air Quality

Air quality is an important consideration during construction and operation phase. Ambient air quality was monitored at project area to develop present baseline data in the area for the proposed project. The impact of project implementation to air quality both in construction phase and operation phase are estimated as follows.

6.1.1 Air Pollution During Construction Phase

During construction phase, particulate matter will be the main pollutant associated with on-site roads traffic (paved and un-paved) and material handling. The entire site will not be simultaneously under heavy construction with different sections generating particulate matter which can cumulatively add upto a significant increase in levels. To avoid generation of excessive amount of particulate matter, water spraying can be performed especially during the dry seasons. Also, management of efficient transportation of construction related vehicles may help in reducing air pollution.

6.1.2 Air Pollution During Operation Phase

The ambient air quality could be maintained by ensuring smoother flow of traffic within the premises by better traffic management plans. It is proposed to have plantation all through the boundaries of the site and along the either side of the internal roads. This will reduce the particulate matters from being transported to the nearby areas. The air emissions from the Diesel Generators will be controlled by using low sulphur content high speed diesels, periodic maintenance of DG sets as per the defined schedule of manufacturer and by providing adequate stack heights as prescribed by CPCB.

The main source of emission will be from the Generator Sets proposed to be installed; it is proposed to install 1 No. of 2,000kVAand the proposed DG will be used only during TNEB power failure.

AERMOD dispersion model was used to predict the GLC (ground level concentrations) from these sources. The following write up gives the details of the modeling methods and the results obtained.

Modelling Method: Dispersion Model – AERMOD

The Pollutants released in to the atmosphere will disperse in the down wind direction and finally reach the ground at a further distance from the source. The concentration of ground level concentrations mainly depends up on the strength of the emission source and micrometeorology of the study area.

To estimate the ground level concentration due to the emission from the project activity, an EPA approved AERMOD View Version 8.9.0 has been used. AERMOD provides option to model emission from a wide range of sources that are present as a typical point source. The model considered the sources and receptors in a undulated as well as plain terrain and a combination of both. The basis of the model is the straight line steady state Gaussian Plume equation, with modifications to model simple point source emissions from stack.

AERMOD model with the following options has been employed to predict the cumulative ground level concentration due to emission from the proposed project.

- Rural dispersion parameters are considered
- Predictions have been carried out to estimate concentration values over radial distance of 10 km around the sources.
- Emission rates from the point sources were considered as constant during the entire period.
- Calm winds recorded during the study period were also taken in to consideration.
- 24 hourly mean meteorological data as per MoEF&CC guidelines has been taken up.
- Mean meteorological data of 2019 has been used for processing.

Predictions of Ground Level Concentration (GLC):

The predictions for air quality were carried out for PM, SOx and NOx. Concentration for using Air Quality Model "AERMOD" developed by the Lakes Environmental Software for atmospheric dispersion of stack emission from point sources.

For the prediction modelling purposes the PM, SOx and NOx are considered. The details of the stack emission for the proposed project are given below:

Table 35: Details of stack emission from the proposed project

S. No.	Stack	Stack height (m)	Stack exit velocity (m/s)	Stack exit temperature in Degree K	Stack diameter (m)	Emission rate of SO2 (g/sec)	Emission rate of NO2 (g/sec)	Emission rate of PM (g/sec)
1.	1 No. of 2,000 kVA DG Set	36	19	524	0.3	0.016	0.090	0.0309

Meteorological data obtained from the Meteorological Centre, for the Madurai Airport has been used for meteorological input like Stability, Wind speed, mixing height and temperature.

In order to assess the impact on air environment a prediction has been made to correlate local meteorological conditions with Gaussian model for analyzing the generation of air pollutants along with air the prevailing air environment. In this modelling by taking annual average wind speed, depending upon the local meteorological condition by way of stability classes C,D the dispersion coefficient in X and Y directions have been computed. The spatial distribution of PM, SOx and NOx obtained from the model output is given below.

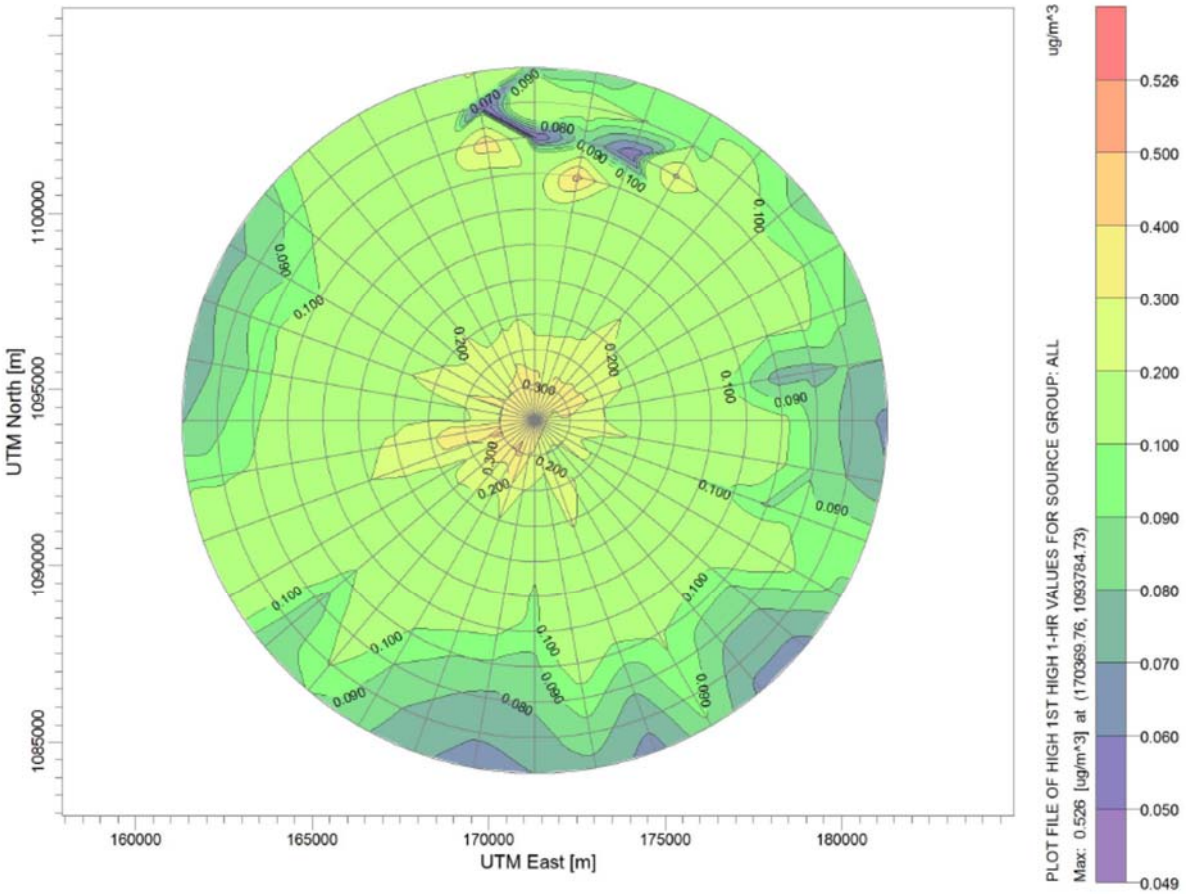


Figure 49: Contour Showing the Predicted Ground Level Concentration – PM (µg/m3)

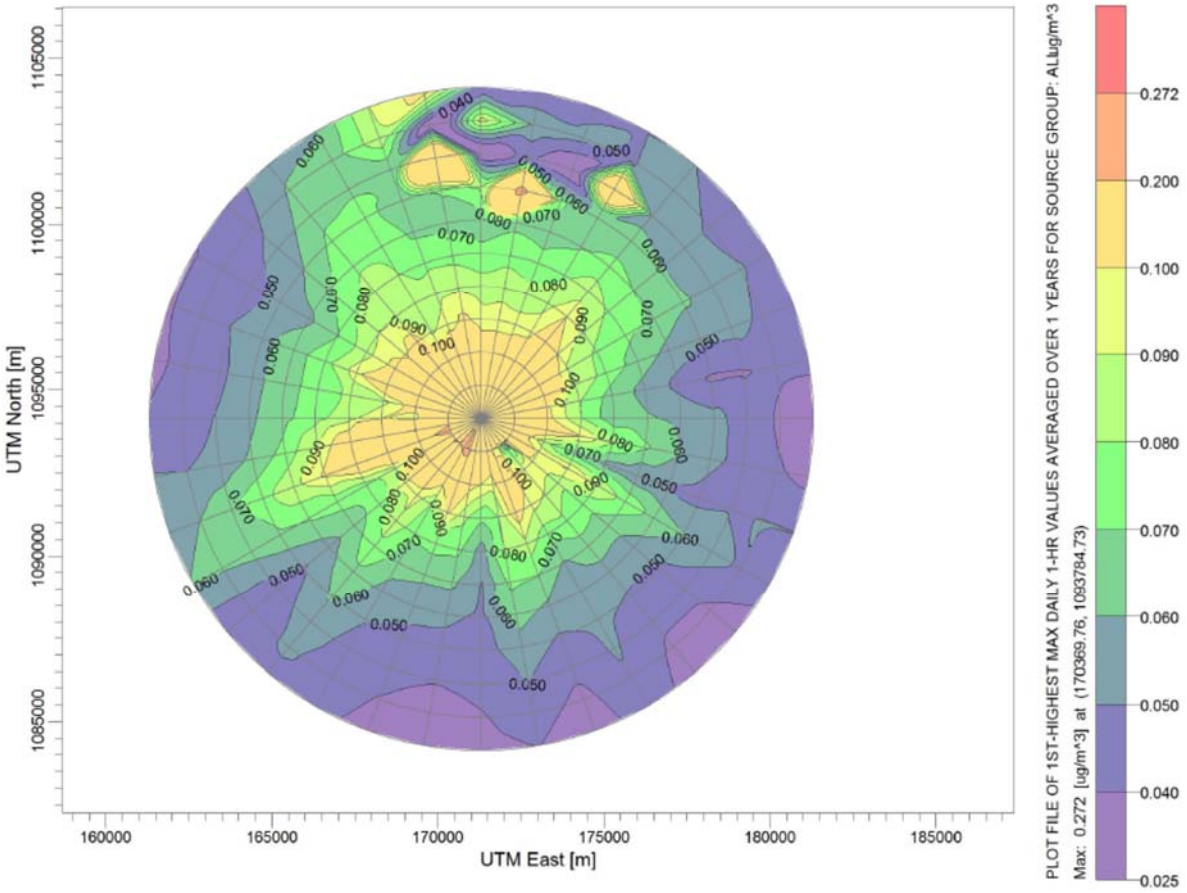


Figure 50 : Contour Showing the Predicted Ground Level Concentration – SO_2 (µg/m3)

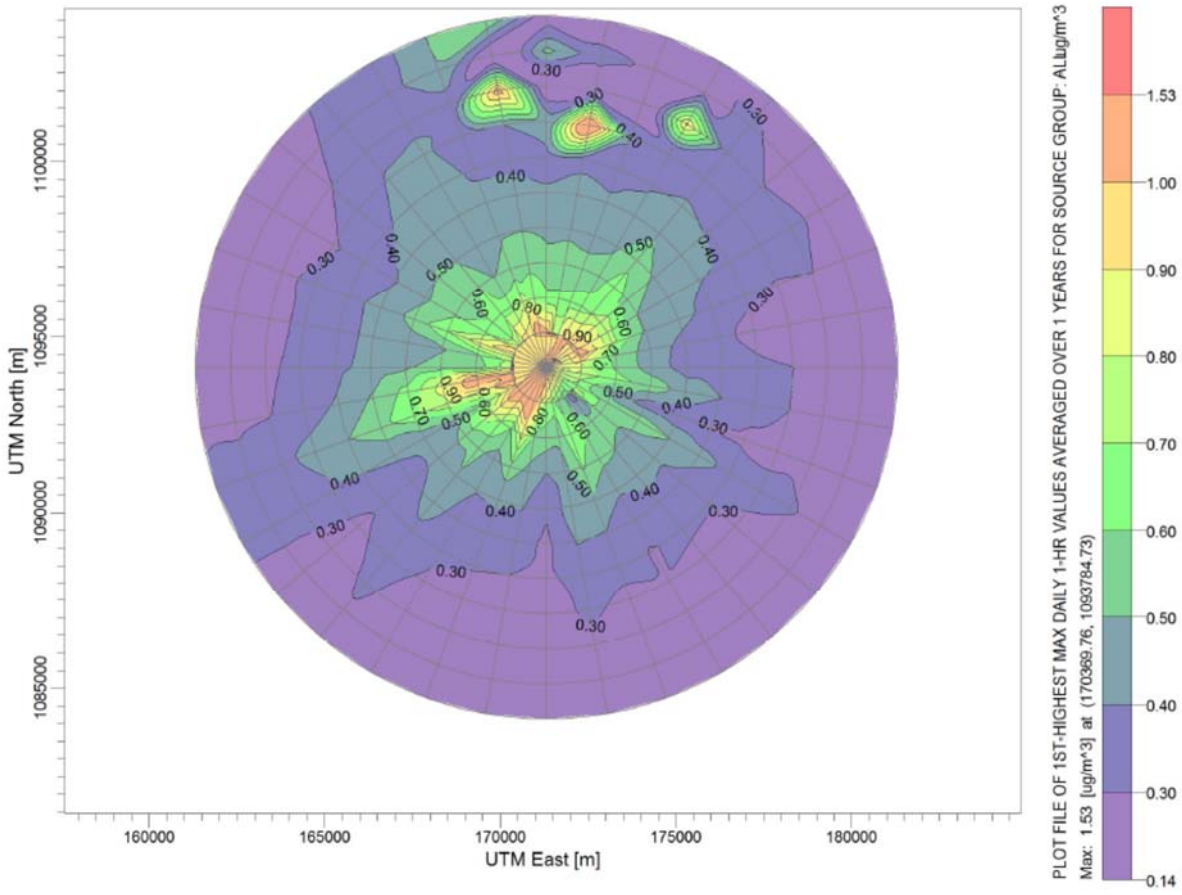


Figure 51 : Contour Showing the Predicted Ground Level Concentration – NO_2 (µg/m3)

The ground level concentrations of PM, SOx and NOx for the project area were estimated and the incremental increase on concentrations above base concentration due to emission is presented below:

Table 36 : Predicted Ground Level Concentrations

	Particulate Matters (PM) in µg/m3	Sulphur dioxide SO_2 in µg/m3	Nitrous dioxide NO_2 in µg/m3
Emission from the project site	0.53	0.27	1.53

Predicted maximum ground level concentration considering mean meteorological data superimposed on the maximum baseline concentrations obtained during study period to estimate the post project scenario which would prevail at the post operational phase. Also, it may be noted that for the change in configuration of DG sets, we will have to redo the entire modelling as the modelling involves metrological data, emission factors and data such as wind stability class, cloud cover will be inputed by the model itself. The overall scenario with predicted concentrations over the maximum baseline concentrations is shown below:

Table 37 : Overall Scenario with predicted concentrations

24-hourly Concentration	Particulate Matters (PM) in µg/m3	Sulphur dioxide SO_2in µg/m3	Nitrous dioxide NO_2in µg/m3
Baseline Scenario (Maximum)	69.4	9.7	18.5
Predicted ground level Concentration (Maximum)	0.53	0.27	1.53
Overall Scenario	69.93	9.97	20.03
NAAQ Standard	100	80	80

Air environment is likely to be affected by the point sources of pollutants as shown from the results above, which may cause marginal increase in air quality levels and the same overall scenario is within the limits of NAAQ Standard.

6.2 Water Quality

Surface water plays major role in irrigation when compared to the ground water source in the project surroundings. Small to medium in size tanks were present in the 10 km radius of project site which acts as primary source for drinking and irrigation purposes. Water sampling has been done to determine the existing quality of ground water in the project area and also to assess the impact from the proposed project. The impact on water quality during construction and operation phases are estimated as follows:

6.2.1 Water Pollution during construction phase

The water requirement for the project during its construction phase is 40-50 KLD and this will be met through tanker water supply. The water required during the construction phase will be utilized for compaction, consolidation and curing. The water utilized for curing will react with the chemical compositions of cement and gets contaminated. The excess water used for curing will get discharged into the natural soil and may pollute the soil. The soil with permeable nature will lead to ground water contamination.

6.2.2 Water Pollution during construction phase

During the operation phase the total water requirement is 1300 KLD which will be met through the TWAD Board by piped water supply. The estimation of water requirement and the water balance chart is shown in table below:

Table 38 :The estimation of water requirement and the water balance chart

Description	Occupancy Load	Total water requirement (L)		
		Fresh water for domestic requirement	Fresh water for Labs& Operation Theatre and Laundry requirement	Flushing Requirement
Hospital				
Inpatient	900	@ 270 LPCD	@ 90 LPCD	@ 90 LPCD
		2,43,000	81,000	81,000
Outpatient	2,700	@ 10.5 LPCD	@ 4.5 LPCD	@ 30 LPCD
		28,350	12,150	81,000
Administrative Staff	2582	@ 15 LPCD	-	@ 30 LPCD
		38,723	-	77,445
Medical Professionals	225	@ 90 LPCD	-	@ 45 LPCD
		20,250	-	10,125
Nursing College Staff	81	@ 90 LPCD	-	@ 45 LPCD
		7,290	-	3,645
Nursing Staff	1025	@ 90 LPCD	-	@ 45 LPCD
		92,205	-	46,103
Laundry	-	-	1,00,000	
Student / Staff (Days scholars)	50	@ 90 LPCD	-	@ 45 LPCD
		4,500	-	2,250
Others (Departmental Staff)	152	@ 90 LPCD	-	@ 45 LPCD
		13,635	-	6,818
Students / Staff (5 Persons per dwelling units for 177 units, 942 students & Nurses)	1,827	@ 90 LPCD	-	@ 45 LPCD
		1,64,430	-	82,215
Others (night shelter & maintenance staffs)	750	@ 90 LPCD	-	@ 45 LPCD
		67,500	-	33,750
Total	**10,291**	**6,79,883**	**1,93,150**	**4,24,350**
		(Say 680 KLD)	**(Say 193 KLD)**	**(Say 424 KLD)**

Per capita water requirement for the inpatients is 450 LPCD, for the boarding staffs and students is 135 LPCD and for day scholars / daily comers is 45 LPCD.
(Source: EIA Guidance Manual – Building, Construction, Townships and Area Development (Annexure 6 - Water Requirements for Different Types of Buildings) published by Ministry of Environment, Forests & Climate Change (MoEF&CC))

Summary of Water Requirement:

Total Water Requirement	=	1297 KLD
Fresh Water Requirement for domestic (Non Flushing)	=	680 KLD
Fresh Water Requirement for Lab & Operation Theatre and Laundry	=	193 KLD
Flushing water Requirement	=	424 KLD

The effluent of 193 KLD (infectious waste water) generated from the hospital building will be treated with ETP. The wastewater generation from the domestic activities which will be treated in Sewage Treatment Plant. The effluent (infectious stream) shall be treated in the Effluent Treatment Plant (Neutralization & Disinfection).

Thus, the major impact during operation phase is the generation of effluent and sewage.

6.3 Waste Management

The solid waste from the proposed development will comprise of biodegradable wastes like domestic food waste, horticultural waste and recyclable waste like plastics, paper, wood, etc. In addition, the operation of the project will generate the biomedical waste, hazardous waste and radioactive waste.

6.3.1 Waste Management during construction phase

The construction debris is major component that needs to be managed.

6.3.2 Waste Management during operation phase

As per the manual on municipal solid waste prescribed by Central Public Health and Environmental Engineering Organization (CPHEEO), the quantity of solid waste generated varies between 0.2-1.5 kg/capita/day. Also, the MoEF&CC Notification dated14th November 2018, states that Organic waste compost/Vermiculture pit with a minimum capacity of 0.3 kg per person per day must be installed.

Domestic Waste:

As per the Central Public Health and Environmental Engineering Organisation Manual, the 60% of domestic waste will be biodegradable solid waste and the 40% of domestic waste will be non-biodegradable solid waste.

Biomedical Waste:

Bio-Medical waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animal or in research activities pertaining thereto or in the production or testing of biological, including categories. The Biomedical waste will comprise of Needle, syringe with needle, Laboratory dish, glass pieces, used / expired chemicals, etc.

Categories of Bio-medical Waste

Hazardous, toxic and Bio-Medical waste has been separated into following categories for the purpose of its safe transportation to a specific site for specific treatment. Certain categories of infectious waste require specific treatment (disinfection/decontamination) before transportation for disposal. These categories of Bio-medical waste are mentioned as below:

Table 39 : Biomedical wastes categories and their segregation, collection, treatment, processing and disposal options

Category	Type of Waste	Type of Bag or Container to be used	Treatment and Disposal options
Yellow	**(a) Human Anatomical Waste:** Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or deep burial
	(b)Animal Anatomical Waste : Experimental animal carcasses, body parts, organs, tissues, including the waste generated from animals used in experiments or testing in veterinary hospitals or colleges or animal houses.		
	(c) Soiled Waste: Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.		Incineration or Plasma Pyrolysis or deep burial In absence of above facilities, autoclaving
	(d) Expired or Discarded Medicines: Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	Yellow coloured non-chlorinated plastic bags or containers	Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200 ^{0}C or to common bio-medical waste treatment facility or

			hazardous waste treatment, storage and disposal facility for incineration at >1200^{0}C Or Encapsulation or Plasma Pyrolysis at >1200^{0}C. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.
	(e) Chemical Waste: Chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility.
	(f) Chemical Liquid Waste : Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids**,** liquid from laboratories and floor washings, cleaning, house-keeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule-III of Bio-Medical Waste Management Rules, 2016.
	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid.	Non-chlorinated yellow plastic bags or suitable packing material	Non- chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and

			shredding. Treated waste to be sent for energy recovery or incineration or Plasma Pyrolysis.
	(h) Microbiology, Biotechnology and other clinical laboratory waste: Blood bags, Laboratory cultures, stocks or specimens of micro- organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non- chlorinated chemicals on-site as per National AIDS Control Organization or World Health Organization guidelines thereafter for Incineration.
Red	**Contaminated Waste (Recyclable)** (a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes)and vaccutainers with their needles cut) and gloves.	Red coloured non-chlorinated plastic bags or containers	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White (Transluce nt)	**Waste sharps including Metals:** Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Puncture proof, Leak proof, tamper proof containers	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having

			consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Blue	**(a) Glassware:** Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydro claving and then sent for recycling.
	(b)Metallic Body Implants	Cardboard boxes with blue colored marking	

(Source: Schedule I of Bio-Medical Waste Management Rules, 2016)

Table 40 : Type of Solid Waste and its disposal mode

S. No.	Type of Solid Waste	Mode of Disposal
1	Bio Degradable Waste*	Shall be treated in Organic Waste Converter (OWC) / Bio-gasPlant & Manure used for gardening
2	Non Biodegradable Waste	To be handed over to authorized recyclers
3	Bio sludge from STP	Shall be used as manure for gardening
4	Biomedical Waste	To be handed over to TNPCB authorized Bio Medical Waste Treatment and Disposal Facility
5	Radioactive Waste	To be handed over to the radioactive disposal facility

* As per the Solid Waste Management Rules, 2016 those bulk generators (i.e. units producing solid waste more than 100 kg/day) shall include the in-house treatment for bio degradable waste.

List of TNPCB authorized TSDF for biomedical waste:

Table 41 : Details of TNPCB authorized Bio Medical Waste Treatment and Disposal Facility

Name and address of the facility	Districts covered	Capacity kg/day
M/s. Ramkey Energy and Environment Ltd., Undurmikidakulam, Virudhunagar District.	Madurai, Virudunagar, Dindigul, Theni & Ramanathapuram.	4000

(Source: https://tnpcb.gov.in)

6.4 Soil Contamination

The soil environment consists of a variety of physical, biological and chemical factors that affect the abundance and diversity of microbes found in the soil. At its basic level, the soil environment consists of a solid and porous fraction. The soil quality in the project was analysed in the laboratory and the soil contamination during construction and operation phase is given below.

6.4.1 Soil Contamination during construction phase:

Soil at and around a construction site may become contaminated due to deposition of construction contaminants from air as well as water runoff of construction contaminants. Soil may act as a sink for pollutants and some of those may accumulate in soil and persist over longer periods of time. Also, the penetration of oily liquids such as kerosene, diesel fuel and gasoline from the construction vehicles will lead to soil contamination.

6.4.2 Soil Contamination during operation phase:

Soil contamination during the operation phase is found to be negligible, since the open ground / vacant area will be reduced. The open discharge of liquid waste and storage of hazardous materials in the natural ground may lead to soil contamination.

6.5 Noise and Vibrations

Noise pollution is generally defined as regular exposure to elevated sound levels that may lead to adverse effects in humans or other living organisms. The baseline noise levels and the vibration levels were measured as per the prescribed guidelines and the increase in noise levels as well as vibration will be during the construction phase of the project. The impact on the noise levels during the construction phase and operation phase are given below.

6.5.1 Noise and Vibrations during construction phase

The main source of noise and vibration will be due to the movement of construction equipment and machineries.

6.5.2 Noise and Vibrations during operation phase

The movement of vehicles and the operation of DG sets will generate the noise resulting in will increase the baseline noise levels.

6.6 Ground Subsidence

It is found that the project site and its surroundings are flat terrain having mean above sea levels from +147.0 m to + 152.5 m. Thus, may be possibility of ground subsidence during the excavation activities of construction phase.

6.7 Offensive Odour

During construction phase, offensive odour is expected due to use of paints and varnishes in the finishing works but will have temporary impact. During operation phase there may be generation of Hydrogen Sulphide (H_2S) gas from the operation of STP. H_2S will have the foul smell i.e. offensive odour.

6.8 Bottom Sediment

There are no surface water bodies in and around the project. The nearest lake Periya Maravankulam Lake is located at distance of 4.6 km in the southern side of project site. However, the open well in the project site has to be protected in order to avoiding sediment deposition during the monsoon season.

6.9 Protected areas

There are no protected areas situated in and around the project site. Nearest protected area (known as Grizzled Giant Squirrel Wildlife Sanctuary) is present at Virudhunagar at a distance of 65 Km from the project area.

6.10 Flora / Fauna Diversity

Biodiversity means the diversity of life in all its forms i.e., the diversity of species, of genetic variations within one species, and of ecosystems. The flora fauna diversity in and around the project site were assessed and of the 103 floral species identified nearly 100 species are Not Evaluated & of Least Concern, though 2 species are in the category of Near Threatened and 1 species in the category of Endangered. The species under Near Threatened and Endangered are found in very low density and had a very sparse distribution. Thus, there will be only minimal impact on the flora fauna diversity.

6.10.1 Flora / Fauna Diversity during construction phase

The ground shrubs will be removed during the construction activity. These disturbances will lead to displacement of fauna in the project site. The project site has scattered vegetative cover only. Thus, the displacement is temporary during the construction phase only.

6.10.2 Flora / Fauna Diversity during operation phase

The vacant land covering 15% of plot area shall be earmarked as per the local prevailing norms in Tamil Nadu. Those projects which attract EIA Notification, 2006 shall provide 15% of plot area for greenbelt development. The greenbelt area shall be earmarked in the periphery of the project site having minimum width of 3m.

6.11 Hydrology

The existing ground water table varies between 12.0 – 15.0 m below the ground level in the project area as per the data published by National Ground Water Mission, Ministry of Jal Shakthi for the Ground Water Resources in Madurai District. During construction and operation phase, there will be no ground water abstraction. However, the increase in paved area will result in increased runoff and decrease in percolation which will affect the existing hydrology. At present, the project site falls under Thiruparankundram block which is categorized as safe as per the categorization of firkas in Tamil Nadu as on March 2017 published by PWD, Tamil Nadu vide G.O. (Ms) No. 161 dated 23.10.2019.

6.12 Topography and geology

Topography is the study of the shape and features of land surfaces. At present the site is vacant flat terrain and it will be converted into the teaching medical hospital campus. Thus, change in existing topography will have some impact on the surroundings of project area. There will not be any change in the geology of the project area. During construction phase, the land level needs to be raised to avoid inundation during rainy seasons. However, the peripheral storm water drain proposed needs to be connected to the external storm water drain so that the surrounding area will not get flooded.

6.13 Involuntary resettlement

The project site is located in the Pudupatti Village which has low population density. The project site in the past was observed to be vacant land and it was allotted by Government of Tamil Nadu for the development of AIIMS campus. Thus, there is no involuntary resettlement.

6.14 Poverty

Multidimensional poverty index are negative indices. Here, the index being closer to the zero denotes lesser inequality and poverty. The overall status of index value of 14 blocks including the Madurai corporation were taken from the District Human development Report 2014 prepared by State Planning Commission, Tamil Nadu. The project site and the surroundings fall under the Tirupparangunram Block which stands second having an index of 0.33. Thus, there are no low income / economically weaker section of people in the vicinity of the project area. Hence, it is deduced that there is no impact.

6.15 Ethnic minority and indigenous people

Nearly 90 % of people in this region are Tamil speaking and the rest includes Telugu, Kannada, Urdu, Hindi, Malayalam, Marathi and Saurashtra in the state of Tamil Nadu. In Madurai, Telugu and Saurashtra people have their settlements. However, the major settlement of these people are found within the Madurai City only and there are no ethnic minority and indigenous people found in the villages which fall adjacent to the project site.

6.16 Local Economy

The term local economy refers to a market and networking system that is part of a specific community. Any developmental activities will improve the local economy. The impact on local economy during construction and operation phases is as follows.

6.16.1 Local Economy during construction phase

Man power requirement for the construction of the project is about 200-300 during peak construction period. These man power required shall be sourced through the local villages surroundings the project site. This will improve the local economy of the people.

6.16.2 Local Economy during operation phase

After the development of the project, there will be permanent commercial establishments in the vicinity of the project area. As well as there will be permanent employment in the operation of the project. This will improve the local economy of the people.

6.17 Land use and utilization of local resources

The project site and its surroundings are vacant land. During establishment the laborer camps will be confined within the project area. Thus, there is no change in land use in the surroundings of the project area. The construction materials will be sourced through from the local market. The water required for the construction shall be sourced through private tankers.

6.18 Water usage

The water requirement for the construction phase will be sourced primarily from groundwater (not from within the site) and supplemented by private tankers and the operation phase will be sourced through the piped water supply of TWAD Board. The TWAD Board is currently meeting the water source from the Vaigai River (Surface water) and the potential bore wells (sub surface water) in the banks of Vaigai River. The surroundings villages depend on ground water for drinking and irrigation purposes. The project activity does not involve any ground water abstraction within the project site.

6.19 Existing social infrastructure and service

The major site access is through roadways from the existing NH 44 which lies at distance of 2.3 km from the project site. During the construction and operation phases, there will be increase in the traffic load on the existing roadways.

6.20 Social institutions such as social infrastructure and local decision-making institutions

There will not be any impact on the existing social infrastructure as well as local decision making institutions. The project falls under Madurai District Administration which is headed by the District Collector.

6.21 Maldistribution of damage and benefit

The project will have not any maldistribution of damage and benefit. The petroleum pipeline passing through the project site shall be demarcated before starting the construction activity.

6.22 Local conflict of interest

During the baseline survey, some preliminary interaction with the people in the project area and its immediate surroundings were carried out. There was no conflict of interest found with the people.

6.23 Cultural Heritage

No cultural heritage structures were found within 5 km radius of project site. Thus, there is no impact on cultural heritage.

6.24 Landscape

At present the project site is vacant land and changes in the existing landscape will be there. The changes in landscape during construction and operation phase are as follows.

6.24.1 Landscape during construction phase

The project will comprise of hospital, college and residential zones. Also, utilities to support the operation of the campus will be within the project site. The maximum height of the buildings will be 27.0 m above the ground level. A maximum of 80% of land area will be used for building footprints, roads and pavements and 20% will be kept vacant.

6.24.2 Landscape during construction phase

The vacant areas will be developed with native trees which will attract the flora and fauna. These trees development will acts a noise barrier and diminishes the air pollutants from the project activity.

6.25 Gender

Gender Inequality Index are negative indices. Hence, closer to zero values denote lesser inequality and poverty. The overall status of index value of 14 blocks including the Madurai Corporation were taken from the District Human development Report, 2014 prepared by State Planning Commission, Tamil Nadu. The project site and the surroundings falls under Tirupparangunram Block which stands second having an index of 0.06. Thus, there are no impacts on gender due to the project activity.

6.26 Children's right

No children's will be engaged for the construction purposes in accordance with the applicable laws. Thus, there will not be any impact on the children's right.

6.27 Infectious disease and HIV/AIDS

Infectious diseases are caused by organisms — such as bacteria, viruses, fungi or parasites. Many organisms live in and on our bodies. Some of the diseases are communicable which may cause harm to people.

6.27.1 Infectious disease during construction phase

There will be an inflow of construction workers into the project site. During this time there may be risks of communicable diseases.

6.27.2 Infectious disease during operation phase

Biomedical waste management needs to be managed so that there will not by any spread of diseases. The segregated waste shall not stored beyond the period of 48 hours as specified under Clause 8 (Segregation, packaging, transportation and storage) S.No. 7 of Bio-Medical Waste Management Rules, 2016 published by Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India. Also, conveyance of untreated sewage in the open mode where public will be directly exposed to untreated sewage will lead to spread of diseases like cholera, diarrhea, etc.

6.28 Occupational Health

Occupational health is a field of health care made up of multiple disciplines dedicated to the well-being and safety of employees in the workplace. Noise generation from the construction activities will result in health hazard to the workers and the same shall be addressed by providing ear muffs to the workers working in high noise zones. It has a strong focus on injury prevention and creating employee awareness. During construction phase, person working in heights face the major risk and proper safety measures shall be provided with Personal Protective Equipment (PPE's). During operation phase, the persons handling biomedical waste shall be trained and ensure that protective measures are in place.

6.29 Accidents

Movement of machines/equipment during construction could be associated with accidents. The walkway for the workers shall be earmarked and proper barricades to be provided. This will avoid accidents during movement of machines/equipment. The persons working in height shall be provided with safety kits. The dedicated safety officer shall be employed.

6.30 Cross-border impact, climate change

During construction and operation phase, the emission of greenhouse gases is expected which will have micro climatic change. However, no major climatic change is foreseen.

The survey results for the items those which have impact are as follows:

Table 42 : Survey Result of environmental and social considerations

<table>
<tr><th>Survey Item</th><th>Result</th></tr>
<tr><td>Air quality</td><td>The results of parameters pertaining to ambient air quality are as follows:
<table>
<tr><th rowspan="2">Range</th><th colspan="5">Parameters</th></tr>
<tr><th>PM10 µg/m³</th><th>PM2.5 µg/m³</th><th>SO2 µg/m³</th><th>NOx µg/m³</th><th>CO mg/ m³</th></tr>
<tr><td>Min</td><td>64.4</td><td>32.7</td><td>9.1</td><td>17.2</td><td>BDL(DL:1.14)</td></tr>
<tr><td>Max</td><td>69.4</td><td>34.1</td><td>9.7</td><td>18.5</td><td>BDL(DL:1.14)</td></tr>
<tr><td>Mean</td><td>67.1</td><td>33.4</td><td>9.5</td><td>17.9</td><td>BDL(DL:1.14)</td></tr>
<tr><td>98%</td><td>69.3</td><td>34.0</td><td>9.6</td><td>18.4</td><td>BDL(DL:1.14)</td></tr>
<tr><td>NAAQ Standards</td><td>100</td><td>60</td><td>80</td><td>80</td><td>2</td></tr>
</table>
Thus, the Ambient Air Quality is within the limits prescribed by NAAQ Standard.

The emissions from the DG sets will results in increase in existing Ground Level Concentrations. However, the dispersion will be predominantly in the North Eastern side which is vacant land. The possible emissions from DG sets are as follows:
<table>
<tr><th>24-hourly Concentration</th><th>Particulate Matters (PM) in µg/m3</th><th>Sulphur dioxide SO_2 in µg/m3</th><th>Nitrous dioxide NO_2 in µg/m3</th></tr>
<tr><td>Baseline Scenario (Maximum)</td><td>69.4</td><td>9.7</td><td>18.5</td></tr>
<tr><td>Predicted ground level Concentration (Maximum)</td><td>0.53</td><td>0.27</td><td>1.53</td></tr>
<tr><td>Overall Scenario</td><td>69.93</td><td>9.97</td><td>20.03</td></tr>
<tr><td>NAAQ Standard</td><td>100</td><td>80</td><td>80</td></tr>
</table>
</td></tr>
</table>

Water quality

The existing groundwater quality of project site. The below results indicate that the water is of good quality.

S. No.	Parameter	Units	Result	Tolerance limits for discharge of trade effluent into Inland Surface Water
1	Colour in Hazen	Hazen	< 1.0	-
2	Turbidity in NTU	NTU	< 0.5	-
3	pH @ 25ºC	--	7.0	5.5 to 9.0
4	Total Hardness as $CaCO_3$	mg/L	271	-
5	Calcium as Ca	mg/L	83	-
6	Magnesium as Mg	mg/L	27	-
7	Chloride as Cl	mg/L	357	1000
8	Sulphate as SO_4	mg/L	114	1000
9	Iron as Fe	mg/L	BDL (DL= 0.01)	-
10	Free Residual Chlorine	mg/L	<0.1	1.0
11	Copper as Cu	mg/L	BDL (DL= 0.01)	3.0
12	Manganese as Mn	mg/L	< 0.03	-
13	Nitrate as NO_3	mg/L	BDL (DL= 1.0)	-
14	Fluoride as F	mg/L	< 0.1	2.0
15	Phenolic Compound as C_6H_5OH	mg/L	<0.001	1.0
16	Cyanide as CN	mg/L	<0.02	0.2
17	Lead as Pb	mg/L	BDL (DL= 0.01)	0.1
18	Zinc as Zn	mg/L	BDL (DL= 0.01)	1.0
19	Anionic Detergents as MBAS	mg/L	<0.01	-
20	Mercury as Hg	mg/L	BDL (DL= 0.001)	0.01
21	Cadmium as Cd	mg/L	BDL (DL= 0.001)	2.0
22	Selenium as Se	mg/L	BDL (DL= 0.01)	0.05
23	Arsenic as As	mg/L	BDL (DL= 0.01)	0.2
24	Aluminum as Al	mg/L	BDL (DL=	-

			0.02)	
25	Boron as B	mg/L	<0.2	2.0
26	Hexavalent Chromium as Cr6+	mg/L	<0.01	0.1
27	Mineral Oil	mg/L	BDL (DL= 0.5)	-
28	Odor	--	Agreeable	-
29	Taste	--	Agreeable	-
30	Total Alkalinity as CaCO3	mg/L	195	-
31	Total Dissolved Solids @ 105ºC	mg/L	962	2100
32	Escherichiacoli (MPN)	MPN / 100ml	<2.0	-
33	Total Coliform (MPN)	MPN / 100ml	<2.0	-
34	Bio chemical oxygen demand (BOD @ 27ºC for 3days)	mg/L	< 1.0	30
35	Chemical Oxygen Demand (COD)	mg/L	< 1.0	250
36	Dissolved Oxygen	mg/L	6.0	-
37	Electrical Conductivity (EC) @ 25ºC	µmhos/cm *	1480	-
38	Oil & Grease	mg/L	< 1.0	10
39	Total Kjeldahl Nitrogen (as N)	mg/L	< 0.7	100
40	Total Phosphorus (as P)	mg/	< 0.2	-

The STP discharge standard prescribed by TNPCB is as follows:

Parameter	Treated Sewage Characteristics (TNPCB Standard)
pH	5.5-9.0
TSS	<30 mg/l
BOD5	<20 mg/l
Coliforms	< 230 MPN/100ml

(Source: NGT (PB) Order dated 30.04.2019 in O.A. No. 1069/2018)

<table>
<tr><td>Waste</td><td>The construction debris of 20 kg/Sq.m/day will be generated during the construction phase.
Biodegradable solid waste and non-biodegradable solid waste is estimated to be generated during the operation phase. Biodegradable solid waste shall be treated in-house and used as manure for gardening. The excess shall be sold to vendors</td></tr>
<tr><td>Soil Contamination</td><td>During construction, erosion of top soil will occur and operation of construction vehicles will leads to soil contamination due to leakage of oil spills.</td></tr>
<tr><td>Noise Levels</td><td>The noise levels in various locations were observed to be in the range of 50.4 dB(A) to 53.1 dB(A).
<table>
<tr><th colspan="2">Observed Noise Levels</th><th colspan="2">TNPCB Max. Permissible Limits in dB (A) Leq (Commercial Zone)</th></tr>
<tr><th>Min</th><th>Max</th><th>Day Time (06.00 AM to 10.00 PM)</th><th>Night Time (10.00 PM to 06.0 AM)</th></tr>
<tr><td>50.4</td><td>53.1</td><td>65</td><td>55</td></tr>
</table>
During construction and operation phase, the operation of construction vehicles will results in increased noise levels. The project site will consist of mixed categories hospital, education institution and residential buildings and hence considered under Commercial Zone Category.</td></tr>
<tr><td>Offensive odor</td><td>Operation of STP & Solid waste management will give offensive odor in the confined locations especially due to presence of Hydrogen Sulphide Gas.</td></tr>
<tr><td>Flora and Fauna</td><td>103 floral species identified nearly 100 species are Not Evaluated of Least Concern, though 2 species are in the category of Near Threatened and 1 species in the category of Endangered. However, the Endangered and Near Threatened species are found in very low density and very sparse distribution.</td></tr>
<tr><td>Topography</td><td>The existing site level to be raised to a minimum level of 1.2 m above the existing ground level to avoid any inundation.</td></tr>
<tr><td>Local Economy</td><td>Currently the project site and its surroundings are vacant land but after the development the project will attract more people towards establishment of commercial developments. This will improve the local economy.</td></tr>
<tr><td>Existing infrastructure and service</td><td>The project development will have increased traffic load in the existing public road network. However, the existing network will cater to the proposed increase in vehicular counts.</td></tr>
<tr><td>Landscape</td><td>The existing project site is vacant. During the development of project, trees of native species shall be planted in the earmarked greenbelt area (15% of total plot area). The number of trees shall be one tree for every 80 Sq.m of plot area</td></tr>
</table>

	as per MoEF&CC Guidelines on Green Cover vide Notification dated 14th Nov 2018.
Infectious disease and HIV/AIDS	There may be spread of communicable diseases during construction phase due to the need for substantial manpower for construction activities.

CHAPTER 7
Impact assessment

7 Impact assessment

Identification of impacts and mitigation measures of the same in Environmental Impact Assessment study helps in quantification and evaluation of impacts. During baseline study several impacts can be identified but it is necessary to identify the critical impacts both positive and negative on various components of the environment that are likely due to the proposed AIIMS campus at Madurai. The environmental impacts can be categorized as either primary or secondary. Primary impacts are the ones that are caused directly due to the project activity on environmental attributes, whereas secondary impacts are indirectly induced.
The construction and operational phase of the project activity comprises various activities, each of which may have either positive or negative impact on some or other environmental attributes.

The proposed project activities would impact on the environment in two distinct phases:

- During construction phase - Temporary or short-term impact
- During operation phase - May have long term impact

7.1 Air Quality

(a) Impacts during Construction Phase

The construction activity will definitely have an impact over the air quality of the area. Construction activities will involve exploration activities, approach roads, operation of batch mixing plants, dumpers, cranes and other construction equipment's, operation of D.G sets for power, transportation of labors and material, etc. All these activities will contribute to air pollution in the area. The nature and extent of impact on air environment will vary from time to time, location to location and through different stages of development of the project.

Particulate Matter ($PM_{2.5}$ and PM_{10},) Sulphur Di-Oxide (SO_2), Oxides of Nitrogen (NO_x), and Carbon Monoxide (CO) will be released as products of fuel burning and during the operation of equipment's. Construction activities like excavation, dumping etc., will generate large amount of dust. Proposed construction will involve transportation of large quantities of construction materials to the project site and all the transportation in the project area will be done by road. This would lead to substantial increase in heavy vehicular traffic in the area and in turn lead to air pollution in the area.

(b) Impacts during Operation Phase

The only long term air quality impact that may be created by the Proposed Project results from the potential increase in project-related exhaust emissions. Operational phase would involve emission from vehicular movement and diesel generators. The primary pollutants associated with vehicular exhaust emissions are NOx and CO. The emission from DG sets will be very negligible since it will be used / operated only during power cut.

7.2 Water Quality

(a) Impacts during Construction Phase

- Construction phase requires large quantities of water to be used in various processing such as curing, concrete mix, consolidation, dust suppression etc.
- The source of groundwater contamination will be due to the wastewater generated by the workforce. Change in quality of water forms an important concern associated within the project particularly during the construction phase.
- Earth works, crushing of stones, cutting and modification of the terrain, alteration of drainage systems and soil erosion are the major factors that affect the water quality during construction phase.

Following are the most susceptible locations for contamination of water during construction:

- Low lying areas will be filled with water during the period of construction. Land fill material may increase the turbidity of this water logged body and thereby inviting vector borne diseases.
- Surface and ground water resources close to construction material storage yard, concrete mixer plants and maintenance sites of construction vehicles; and,
- Leakage of lubricant or spill may cause water pollution of surface and ground water body.
- Impact due to accidental spills or due to bad construction practice, will be short term and low in magnitude and confined to the construction period only.

(b) Impacts during Operation Phase

During operation phase primary concerns relating to water quality associated with wastewater discharge from project site; contamination of rainwater by generated solid waste & oil/fuel and water resource depletion due inadequate conservation practices. The total water requirement for operation of project is 1300 KLD which will be met through the TWAD Board by piped water supply within the project site.

The generated sewage shall be treated in Sewage Treatment Plant (STP) and the effluent shall be treated in Effluent Treatment Plant (ETP). The treated sewage and effluent shall be recycled within the campus for toilet flushing and gardening. The Heating, ventilation, and air conditioning (HVAC) system shall be partially designed based on water cooling system and thus the entire treated water shall be recycled within the campus and hence achieve Zero Liquid Discharge (ZLD).

7.3 Waste Management

a) Impacts during Construction Phase

Solid waste generated during site preparation and construction work would include cut vegetation and typical construction waste (e.g. wasted concrete, steel, wooden scaffolding and forms, bags, waste earth materials, etc.). This waste would negatively impact the site and surrounding environment if not properly managed and ultimately disposed for level rising

within the project site. The project site is vacant land and devoid of buildings. Hence no demolition activities are involved in during site clearance.

b) Impacts during Operation Phase

During Operation Phase, Solid waste generated from the project will be categorized as follows:-

- Biodegradable Solid Waste
- Non-Biodegradable Solid Waste
- Biomedical Waste
- Hazardous waste
- E-waste
- Radioactive waste

Biodegradable and Non-Biodegradable Solid waste, Biomedical waste, Hazardous waste and E-waste generated from the project should be managed and disposed as per the applicable Environmental Rules and Regulations.

If wastes are not managed properly it will cause severe adverse effect to health and environment.

7.4 Soil Contamination

(a) Impacts during Construction Phase

No blasting is envisaged during construction phase of the project. The rehabilitation and resettlement issues are not involved in the project. Furthermore the existing environmental conditions of the project site reveal that the land is not contaminated or polluted. The storage of construction materials within the project site, improper management of solid waste generated due construction activity will pollute the soil.

(b) Impacts during Operation Phase

Improper handling of solid waste and liquid waste will result in soil contamination. However proper management and control of solid and liquid waste is necessary to prevent soil contamination and maintain the land environment.

7.5 Noise and Vibrations

(a) Impacts during Construction Phase

The main sources of noise pollution in the process of construction are pulverizing, cement concrete mixing, welding, drilling and several other machineries and Vibrations; caused due to dumpers, machineries and bulk careers. There would be a communication problem among work persons due to ambient noise of the equipment; this can be localized and temporary in nature.

The noise levels in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which in-turn is being enforced by Government of India. The acceptable limits for each shift being of 8-hour duration, the equivalent noise level exposure during the shift is 90 dB (A). Hence noise generated due to various activities in the construction camps may affect workers, if equivalent 8-hour exposure is more than the safety limit.

The noise likely to be generated during excavation, loading and transportation of material will be in the range of 90 to 105 dB (A) and this will occur only when all the equipment's operate together and simultaneously. This will be a remote possibility. The workers in general are likely to be exposed to an equivalent noise level of 80-90 dB (A) in an 8 hour shift for which all statutory precautions will be taken into consideration.

The construction equipment like drills, vibrators and floor grinding machines that have high noise emissions levels can affect the personnel's, operating the machines. Use of proper personal protective equipment (PPE's) will mitigate any adverse impact of the noise generated by such equipment.

Continuous Exposure of workers to high sound levels may result in annoyance, fatigue. This negative impact will be short-term and is not considered to be a significant threat to the health or well-being of humans. The construction Equipment Noise Emission Levels is given below in Table.

Table 43 : Construction Equipment Noise Emission Levels

Equipment's	**Typical Noise Level - dB (A) 50 ft. from Source**
Air Compressor	81
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane, Derrick	88
Crane, Mobile	83
Generator	81
Grader	85
Jack Hammer	88
Loader	85
Pump	76

Rail Saw	90
Rock Drill	98
Roller	74
Saw	76
Scraper	89
Shovel	82
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	88

(Source: http://cpcbenvis.nic.in)

(b) Impacts during Operation Phase

During operational phase the expected source of noise pollution are:

- Diesel generator operations
- Increase in transportation noise from within the site.

7.6 Ground Subsidence

The project site is a flat terrain and there is no possibility of ground subsidence. However, there may be possibility of labor accidents in which workers or operators will be buried under collapsed ground and/or construction machinery such as a drag-shovel that falls or topples over the edge of the trench during excavation. Offensive odour

During construction phase, the source of offensive odour is negligible. However, during the operation phase, the Hydrogen Sulfide (H_2S) is a gas commonly generated in sewage treatment and utility facilities and sewers. The H_2S up to a concentration of 1.5 mg/l will results in rotten egg smell, at concentrations above 2.0 mg/l prolonged exposure may cause nausea, tearing of the eyes, headaches or loss of sleep. Could even result in airway problems (bronchial constriction) in some asthma patients. (Source: https://www.osha.gov/)

7.7 Bottom Sediment

There is no possibility of impact on bottom sediment due to the project proposal.

7.8 Protected areas

There are no protected areas within 15km of project site. Hence, there will not be any impact on the protected areas due to the proposed AIIMS Campus.

7.9 Flora / Fauna diversity

During construction, there will be temporary impact on the flora / fauna diversity as follows:

- **Due to on-site disturbance:**

The existing ground will be cleared for the construction activity. Thus, the temporary displacement of fauna will occur.

- **Off-site impacts on habitats:**

The noise generation, incremental pollution load in air and water environment during the construction phase will have the impact on the surrounding peoples as well as flora fauna diversity. The flora will have the stunted growth and reduction in pollination. There will be temporary displacement of fauna and this will impact the diversity and ecology of the site.

- **Sourcing of materials:**

The materials used and their processing and production will have a major impact on biodiversity. Timber, gravel, sand, iron ore, rocks etc. are all major materials needed for the construction industry and the production of these materials can impact heavily on biodiversity.

7.10 Hydrology

As per the data published by National Water Mission, Ministry of Jal Shakti, Government of India, in Madurai District, during the pre monsoon, the water level generally in declining trend ranges from G.L. to 15m. The depth of well below Ground Level 12.0m are become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. Thus, there is no impact on the existing hydrology.

7.11 Topography & Geology

a) Impacts during Construction Phase

It is proposed to level the entire project area and to use the earthen material excavated, for the raising of low lying areas. Also, the contours of natural drainage will not be disturbed. There is no deep excavation/blasting involved during the construction thus, there is no impact on topography and geology in the project area.

b) Impacts during Operation Phase

The major envisaged topographical change would be limited in immediate vicinity of the proposed project area. The impact is going to be minimum and negligible. The change in topography will be due to the construction of buildings.

7.12 Involuntary resettlement

The project site is allotted by Government of Tamil Nadu for the development of AIIMS Campus. In the past, the project is vacant and there is no involuntary resettlement.

7.13 Poverty

There are no economically weaker section people in the surrounding of project site. Thus, there is no impact on poverty.

7.14 Ethnic minority and indigenous people

The Telugu and Saurashtra people are the minority people in the immediate surroundings of project site. However, there will not be any impact on the minority and indigenous people.

7.15 Local Economy

The proposed AIIMS campus will have the positive impact due to the following activities:

- Income to the equipment and material suppliers
- This project will promote the procurement of equipment's and machineries for various activities involved during the construction phase and operation phase where it is technically and commercially feasible.
- Procurement of material suppliers for various activities involved in the construction phase which will also promote the growth of the economy of the local material suppliers in and around the proposed Project site.

Also, there will be employment opportunity to the local people and the project development will accelerate the development of supporting facilities and ancillary development such as roads, power supply, drinking water, sanitation, housing development.

At this stage it is not possible to accurately determine the number of workers that will be employed at site during the construction phase but it is estimated that this number would be between 300 - 500 persons. These levels of short-term employment opportunities would have a positive impact on the local economy and on regional unemployment numbers.

7.16 Land use and utilization of local resources

The project site is a vacant land. The project site will have the change in land use pattern and the concrete cover will cover 50-60% of the land area. This will have the impact of micro climate change i.e. increase in temperature levels and during monsoon days the runoff will increase. Timber, gravel, sand, iron ore, rocks etc. are all major materials which will be sourced local for the construction activities.

7.17 Water Usage

The water during the construction and operation phase will be sourced through the piped water supply provided by TWAD Board. The TWAD meets its water demand through surface

and subsurface sources through water supply schemes on the Vaigai River. Vaigai River is located at a distance of 9.0 km from the project site. Thus, there will not be any impact due to water usage since no tapping of ground water is envisaged within the project site. However during the operation phase there will be impact due to substantial use of fresh water.

7.18 Existing social infrastructure and service

Only existing infrastructures such as road, water supply, TNEB line will be utilized for the project site. Increase in traffic load is anticipated during both construction and operation phase of the hospital. Hence, the traffic management plans is required to maintain the better environment with smooth traffic flow in and around the project site. The well-established social infrastructure like hospitals, temple, community centre, roads, bridges, telecommunication and others similar are available/ existing within 10 km radius study area.

7.19 Social Institutions such as social infrastructure and local decision-making institutions

There will be no possible impact on the existing social infrastructure and local decision-making institutions due to proposed project. The project falls under Madurai District Administration which is headed by District Collector.

7.20 Maldistribution of damage and benefit

There will be no possible impact on the Maldistribution of damage and benefit due to the proposed project.

7.21 Local conflict of interest

There is no impact envisaged on the Local conflict of interest due to the proposed project. As per information collected in the social assessment field survey, most people in study area welcome the proposed project as they see a direct benefit and improvement in the regional healthcare facilities.

7.22 Cultural heritage

No cultural heritage structures were found within 5 km radius of project site. Thus, there will be no possible impact on cultural heritage due to proposed project.

7.23 Landscape

The project proposal attracts Environmental Clearance and as per the directions of SEAC & SEIAA, Tamil Nadu it is mandatory to provide 15% of plot area as greenbelt area. The following native species shall be planted in the earmarked area.

Table 44 : List of Species recommended for greenbelt

S.No.	Botanical Name	Common Name	No. of trees
1.	Azadirachta indica	Neem tree	Number of trees should be as per MoEF&CC Guidelines on Green Cover vide Notification dated 14thNov 2018 i.e. 1 tree per 80 Sq.m of land area
2.	Ficus religiosa	Peepal tree	
3.	Polyalthia longifolia	Mast tree	
4.	Mimusops elengi	Bullet wood tree	
5.	Albizial ebbeck	Lebbek tree	
6.	Pongamia pinnata	Pongam tree	
7.	Thespesia populnea	Portia tree	
8.	Calaphyllum inophyllum	Punnai tree	
9.	Syzygium cumini	Jamun tree	
10.	Madhuca longifolia	Iluppai tree	

7.24 Gender

As per field survey conducted in the study area. There is no possible impact on the gender due to the proposed project.

7.25 Children's rights

No activity is planned in the proposed project during both construction and operation phase that will violate the children's rights. Thus, there is no possible impact on the gender due to the proposed project.

7.26 Infectious disease and HIV/AIDS

During Construction Phase

The construction project may create potential risks for the spread of HIV/AIDS among construction workers, contractors, and local communities due to inflow of construction workers into the project site. The contractors shall be vigilant to detect workers showing symptoms of communicable diseases. Health checkup of the contract labors shall be done/ recorded regularly. All illness shall be reported and recorded. The awareness program should be conducted periodically about HIV/AIDS and STDs among construction workers, contractors in project site and local communities in the project area.

During Operation Phase

Poor sanitation will cause diseases such as cholera, diarrhoea, dysentery, hepatitis A etc., Sanitation is the process of keeping places clean and healthy, especially by providing a clean

water supply and proper sewage system to prevent human contact with faeces. All the human excreta and liquid wastes from all sanitation facilities including toilets must be disposed of safely. Maintaining network-based sewerage systems, recycling and reusing of treated waste water, promoting proper disposal and treatment of sludge from on-site installation (Sewage Treatment Plant and Effluent Treatment Plant), ensuring safe collection of sewage, effluent, and their subsequent disposal after treatment are some of the measures of good sanitation.
Inadequate biomedical waste management will cause adverse effect to health and environment. Hence biomedical waste should be collected, segregated, treated and disposed as per Bio-medical Waste management rules 2016.

7.27 Occupational Health (including work safety)

There is possible for fire risk due to presence of "Class A" petroleum pipeline in the project site. Hence Fencing shall be provided on sides of petroleum pipeline. In addition Safe boundary zone shall be provided around pipeline area to avoid the accident.

The activities such as operation of DG sets, movement of vehicles, drilling during construction will leads to increase in noise levels which in turn affect the health of the workers engaged in the project. During construction phase, workers are exposed to various risks (working in height, electrical hazards, accidents, falling objects & materials) involved in construction works and other occupational diseases and health hazards which cause injuries and illnesses. An effective system of safety in construction should be created and followed strictly. Personal Protective Equipment (PPE's) shall be provided to the construction workers. During operation phase, the persons handling biomedical waste shall be trained and protective measures shall be ensured.

During operation phase, the electrical failure, transportation emergency, structural damage, fire hazard are the possible impacts with respect to the occupational health.

7.28 Accidents

Movement of machines/equipment during construction is associated with accidents. The walkway for the workers shall be earmarked and proper barricades to be provided. This will avoid accidents during movement of machines/equipment. The persons working in height shall be provided with safety kids. The dedicated safety officer shall be employed.

During operation phase, Fire alarm and fire fighting system should be installed to manage the fire accident, lighting arrester should be fixed in each building. Risks in the industrial sheds will be due to natural calamities like earthquake, flooding and others such as fire and accidental hazards. For earthquake resistance, the structural design shall be as per is certified as per IS code 875 and IS- 1893-2002 for Seismic Zone 2.

7.29 Cross-border impact, climate change

During construction and operation phase, the emission of greenhouse gases is expected which will have micro climatic change. However, there will not be any major climatic change. The proposed project shall be designed to adhere with the Energy Conservation Building Code (ECBC, 2010).

Table 45 : Table showing the Impacts based on Aspects involved in the project activity							
Category		**Item**	**Scoping Result**		**Survey Result**		
			CP	**OP**	**CP**	**OP**	**Aspects**
Pollution control measures	1	Air quality	D-	D-	D-	D-	Increase in Ground Level Concentration of pollutants.
	2	Water quality	D-	D-	D-	D-	Discharge of effluent and sewage from the project activity
	3	Waste	ID-	D-	ID-	D-	The bio-degradable solid waste shall be treated within the campus and the non-bio-degradable solid waste shall be handed over to recyclers. The bio-medical waste shall be segregated and handed over to disposal facility on daily basis.
	4	Soil contamination	D-	NI	D-	NI	There is no major toxic discharge towards soil contamination. The development of greenbelt along the periphery of the project will helps in control of soil erosion.
	5	Noise and vibrations	ID-	ID-	ID-	ID-	The vehicular movement will increase in noise levels but which is intermittent and temporary.
Natural environment	6	Flora/ Fauna & Biodiversity	D-	D+	D-	D+	CP: The ground shrubs will be removed and temporary displacement of flora and fauna. OP: Plantation of native species trees within project area will attract flora and fauna.
	7	Topography and geology	D	D	D	D	CP: Vacant land is converted into the teaching medical hospital campus. Change in existing land use of the project site. OP: Increase in paved areas and level rising will change the existing drainage pattern.

Table 45 : Table showing the Impacts based on Aspects involved in the project activity							
Category		**Item**	**Scoping Result**		**Survey Result**		
			CP	**OP**	**CP**	**OP**	**Aspects**
Social environment	8	Local economy (Employment and livelihood)	ID+	ID+	ID+	ID+	CP/ OP: The project site and its vicinity has scattered population. After the development there will be increase in population density due to employment opportunity
	9	Land use and utilization of local resources	ID	ID	ID	ID	Change in Land use of project area, Utilization of local resources from the nearby areas – Manpower, Water & Construction Materials
	10	Existing social infrastructure and service	ID	ID	ID	ID	Increase in vehicular count on the existing road network, which is sufficient to cater the vehicular count.
	11	Landscape	D-	D+	D	D	Plantation by native species/Introduction of new species
	12	Infectious disease and HIV/AIDS	ID-	ID-	ID	ID	Poor sanitation will result in health impacts due to diseases, Improper handling of biomedical waste will cause adverse effect to health and environment.
	13	Occupational Health (including work safety)	ID-	D	D	D	Risk and Hazards involved in construction activities may be anticipated. Accidental Hazards involved in existing petroleum pipeline leaks & bursts Electrical & Fire hazards involved during the operation of the facility
	14	Accident	ID-	ID	ID	ID	Accidents involved in construction vehicles movement Accidents that might occur due to improper traffic movement during the operation of the facility

CHAPTER 8
Mitigation measures and cost

8. Mitigation measures and cost

Environmental pollution during construction stage will be limited and for a temporary period during the construction activity. Construction shall be planned in such a way that excavated material shall be disposed safely. The manpower required for these activities shall preferably be employed from nearby villages so that avenues of employment will be open to local people.

Directly or indirectly all the environmental components get affected due to the construction activity. The following environmental protection and enhancement measures are suggested for implementation by the contractor or the authority during the construction as applicable.

8.1 Air Quality

The vehicles carrying building construction material as well as the construction machinery generate emissions and pollute the environment. Dusts include brick/blocks and silica dusts, wood dust from joinery and other woodworking and from earthmoving and other vehicle movements within the site. Construction machineries pose a serious threat to air quality. It is estimated that construction machineries emit toxic pollutants and are sources of fine particulate matter (PM 2.5, which lodges deeply in the human lung) and oxides of nitrogen (NOx), a key ingredient in the formation of ground-level ozone and urban smog.

(a) Mitigation measures during Construction Phase

Access road - Every main haul road shall be paved with concrete, bituminous materials, hardcore or metal plates, and kept clear of dusty materials; or sprayed with water for dust suppression so as to maintain the entire road surface wet.

Construction Equipment's

- Transport vehicles and construction equipment's / machineries shall be properly maintained to reduce air emissions.
- Equipment's shall be periodically checked for pollutant emissions against stipulated norms.
- Use of covering sheet to prevent dust dispersion.
- Use of covering sheets will be done for trucks to prevent dust dispersion from the trucks.

Use of vehicle

- Immediately before leaving a construction site, every vehicle shall be washed to remove any dusty materials from its body and wheels.
- Whenever a vehicle leaving a construction site is carrying a load of dusty materials, the load shall be covered entirely by clean impervious sheeting to ensure that the dusty materials do not leak from the vehicle.

- On-Road- Inspection will be done for black smoke generating machinery.
- Promotion of use of cleaner fuel.
- Vehicles having pollution under control certificate shall be allowed to ply.
- Reducing the speed of a vehicle to 20 kmph can reduce emissions by a large extent.
- Locally found gravel & demolition debris will be applied to access roads as it adds a protective layer over the exposed soil and helps control dust generation.
- PUC (Pollution under Control Certificate) certified vehicles will be used to avoid the exhaust emission.

Stock Piles

- All loose material either stocked or transported shall be provided with suitable covering such as tarpaulin, etc.
- Over Burden (OB) waste dumps shall be sprayed with water as they are major sources of airborne particulate matter/dust. The waste dumps will be reclaimed / afforested to bind the loose soil and to prevent soil erosion.
- Barriers will be set up around the construction areas to prevent foreign materials/chemicals entering the area.

DG Set

Temporary power connection during construction shall be obtained from Tamil Nadu Generation & Development Company (TANGEDCO). The power demand during peak construction will be below 500KVA. Low Sulphur High Speed Diesel (HSD) with Sulphur Content of ≤0.005% shall be used as fuel for DG sets during power cuts. D.G. Set will be placed in an acoustic enclosure. Location of DG sets and other emission generating equipment will be decided keeping in view the predominant wind direction so that emissions do not affect nearby residential areas. Stack height of DG sets will be accordance with CPCB norms.

(b) Mitigation measures during Operation Phase

- Adequate parking provision and proper traffic arrangement for smooth traffic flow.
- The height of the stack for DG set shall be provided as per the CPCB norms. Proper maintenance of DG sets shall be done.

To control the air emissions from these D.G sets, adequate stack height is provided to release the exhaust flue gases into the atmosphere at a height at which efficient dispersion takes place. Since the DG sets are operated only during power failure, the emission is not continuous and hence the impact due to these emissions is not significant.

Stack heights* as prescribed by CPCB.

$$H = h + (0.2)\ (kVA)^{0.5}$$

Where, H = Total height of stack in meters from ground level
h = height of the building in meters
kVA = Capacity of DG sets in kVA

*Source: CPCB PCLS/02/2010 Sixth Edition Published by Central Pollution Control Board, New Delhi

Stack height for 2,000 kVA (1 No.) DG sets

$$H = h + (0.2)\ (kVA)^{0.5}$$

Where, H = Total height of stack in meters from ground level
h = 27 m
kVA = Capacity of DG sets in kVA say 500 kVA
$H = 27 + (0.2)\ (2{,}000)^{0.5}$
$= 27 + 8.94$
= 35.94 m (Say 36 m)

Thus, a stack height of 36 m above the ground level should be provided as per CPCB Norms.

- Low sulphur diesel shall be used in DG set.
- Three tier tree plantations shall be made along the boundary of the project site.
- Internal roads shall be maintained so that no fugitive dust emission shall be there.
- PUC certified vehicles will be used to avoid the exhaust emission.

Retrofitting of DG Sets:

As per TNPCB Notification No. TNPCB/DD (L)/02151/2019 dated: 19-10-2020 it is mandatory to retrofit the emission control devices/equipment in DG sets with capacity of 125 kVA and above in Tamil Nadu. The compliance to retrofit the DG sets shall be carried out before 31/03/2021. The copy of the said TNPCB Notification is enclosed as Appendix 2 for reference.

The proposed project operation should operate and maintain the APC (Air Pollution Control) measures efficiently and continuously so as to not exceeding the Ambient Air Quality / Emission standards prescribed by the CPCB.

Table 46 : National Ambient Air Quality Standards

	Pollutant	Time Weighted Average	Concentration in Ambient Air		Method of Measurements
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), µg/m³	Annual*	50	20	-Improved West and Geake - Ultraviolet fluorescence
		24 hours**	80	80	
2	Nitrogen Dioxide (NO_2), µg/m³	Annual*	40	30	-Modified Jacob & Hochheiser (Na – Arsenic) - Chemiluminescnece
		24 hours**	80	80	
3	Particulate Matter (size less than 10 µm) or PM_{10} µg/m³	Annual*	60	60	- Gravimetric -TOEM -Beta attenuation
		24 hours**	100	100	
4	Particulate Matter (size less than 2.5µm) or $PM_{2.5}$ µg/m³	Annual*	40	40	- Gravimetric - TOEM - Beta attenuation
		24 hours**	60	60	
5	Ozone (O_3), µg/m³	8 hours**	100	100	- UV photometric Chemilminescence - Chemical Method
		1 hour**	180	180	
6	Lead (Pb), µg/m³	Annual*	0.50	0.50	- AAS/ICP method after sampling on EPM 2000 or equivalent Filter paper - ED-XRF using Teflon
		24 hours**	1.0	1.0	

7	Carbon Monoxide (CO), mg/m³	8 hours**	02	02	- Non Dispersive Infra Red (NDIR) - Spectroscopy
		1 hour**	04	04	
8	Ammonia (NH_3), µg/m³	Annual*	100	100	- Chemiluminescence - Indophenol blue method
		24 hours**	400	400	
9	Benzene (C_6H_6), µg/m³	Annual*	05	05	- Gas chromatograph based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only, ng/m³	Annual*	01	01	- Solvent extraction followed by HPLC /OC analysis
11	Arsenic (As), ng/m³	Annual*	06	06	- AAS/ICP method afar sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m³	Annual*	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

** 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note: Whenever and wherever results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation

(Source: CPCB Notification No. B-29016/20/90/PCI-I Dated 18.11.2009)

Table 47: Emission Limits for New Diesel Engines up to 800 KW for generator sets (Gen sets)

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m^{-1})
	NOx +HC	CO	PM	
Upto 19 KW	≤7.5	≤3.5	≤0.3	≤0.7
More than 19 KW upto 75 KW	≤4.7	≤3.5	≤0.3	≤0.7
More than 75 KW upto 800 KW	≤4.0	≤3.5	≤0.2	≤0.7

(Source: G.S.R. 771(E) dated 11th December, 2013)

Table 48 : Emission Standards for Diesel Engines (Engine Rating More than 0.8 Mw (800 KW) For Generator Set Applications and Other Requirements

Parameter		Area Category	Total engine rating of the plant (includes existing as well as new generator sets)	Generator sets commissioning date		
				Before 1.7.2003	Between 1.7.2003 and 1.7.2005	On or after 1. 7. 2005
NOx (as NO_2) (AT 15% O_2) , dry basis, in ppmv		A	Upto 75 MW	1100	970	710
		B	Upto 150 MW			
		A	More then 75 MW	1100	710	360
		B	More then 150 MW			
NMHC (as C)(at 15% O_2), mg/Nm^3		Both A and B		150	100	
PM (at 15% O_2), mg/Nm^3	Diesel Fuels- HSD & LDO	Both A and B		75	75	
	Furnace Oils- LSHS & FO	Both A and B		150	100	
CO (at 15% O_2), mg/Nm^3		Both A and B		150	150	
Sulphur Content in fuel		A		< 2%		
		B		< 4%		
Fuel specification		For A only	Up to 5MW	Only Diesel fuels (HSD, LDO) shall be used.		
Stack height (for generator sets commissioned after 1.7.2003)		Stack height shall be maximum of the following, in meter: (i) 14 $Q^{0.3}$, Q= Total SO_2 emission from the plant in kg/hr. (ii) Minimum 6 m. above the building where generator set is installed. (iii) 30 m.				

Note:

1. Acronyms used :

MW	:	Mega(10^6) Watt	FO	:	Furnace Oil
NO_x	:	Oxides of Nitrogen	HSD	:	High Speed Diesel
NO_2	:	Nitrogen Dioxide	LDO	:	Light Diesel Oil
O_2	:	Oxygen	LSHS	:	Low Sulphur Heavy Stock
NMHC	:	Non-Methane Hydrocarbon	kPa	:	Kilo Pascal
C	:	Carbon	mm	:	Milli (10^{-3}) metre
PM	:	Particulate Matter	kg/ hr	:	Kilo (10^3) gram per hour
CO	:	Carbon Monoxide	mg/Nm^3	:	milli (10^{-3}) gram per Normal meter cubic
SO_2	:	Sulphur Dioxide			
ppmv	:	parts per million (10^6) by volume			

2. Area categories A and B are defined as follows:

Category A: Areas within the municipal limits of towns/cities having population more than 10 lakhs and also upto 5 km beyond the municipal limits of such towns/cities.

Category B: Areas not covered by category A.

(Source: CPCB PCLS/02/2010 Sixth Edition)

8.2 Water Quality

(a) Mitigation measures during Construction Phase

- The water demand is for sprinkling, tyre washing, curing, etc. This water demand shall be sourced through tankers supply.
- Excavation can be avoided during monsoon season.
- Garland drain will be provided to collect the runoff generated at the construction activities. This will be used for ancillary purpose viz., curing, sprinkling of water for dust suppression, etc.
- Runoff from the construction site will not be allowed to stand or enter into the roadside or nearby drain. Adequate measures will be taken to collect such runoff and either will be reused (if possible) or disposed at the designated construction waste disposal location.
- Community toilets with septic tanks and soak pit will be provided on the site during construction phase to prevent wastewater polluting the groundwater or surrounding water bodies.
- To prevent surface and ground water contamination by oil/grease, leak proof containers will be used for storage and transportation of oil/grease.
- Pre-cast eco-friendly construction technology is proposed for the development.
- Water Demand and Dust pollution will significantly reduce due to the use of Pre-cast construction technology.
- Chemical admixtures (Curing agents) shall be used for curing of precast walls and panels.
- Concrete structure shall be covered with thick cloth / gunny bags and then water will be sprayed for curing. This will reduce water demand and also help in complete curing.
- Curing shall be taken-up during early morning and late evenings to avoid evaporation loses.
- The water demand for the labour camp will be sourced from nearby tanker water suppliers. The water demand is for washing, cooking, drinking, etc. The wastewater from the labour camp shall be diverted to septic tank and soak pit. The proposed size of the septic tank and soak pit are 3m x 3.5 m x 3.0 m and 3 m dia x 4.0 m respectively.
- Ready Mix Concrete (RMC) with curing agents shall be used
- Best practices for water conservation, dust suppression and noise pollution reduction shall be implemented.

(b) Mitigation measures during Operation Phase

- The fresh water sourced from TWAD board shall be treated in Reverse Osmosis (RO) system to meet the drinking water standards.
- The waste water generated from project to be treated, recycled and reused for flushing and green belt development purposes.

- The Sewage treatment plant and Effluent treatment plant should be designed to treat waste water in order to achieve the effluent disposal standards prescribed by the CPCB/TNPCB.
- Dual plumbing system for reuse of treated wastewater for flushing purposes.
- To augment the groundwater table, Rain water harvesting system should be provided based on the soil condition.
- Provision of Storm water drainage system with adequate capacity and have to ensure proper maintenance of storm water drainage.
- Storm water will be managed through regular inspection and cleaning of storm drains; Clarifiers or oil/water separators shall be installed in all the parking areas; Provision of secondary containment and dykes in fuel/oil storage facilities and of slit traps in storm water drains will be made.

Comparison for various technologies for sewage treatment plant and Assessment of Technology options for Sewage Treatment Plant

As per the CPCB Study on Performance Evaluation of STPs (Refer Table 49), the Treated effluent quality with respect to BOD, COD, SS, Coliform reduction is better in SBR and MBR plant among other treatment technologies.

Table 49: Comparison for various technologies for sewage treatment plant

Assessment Parameter/Technology	**ASP*,[a]**	**MBBR*,[a]**	**SBR*,[a]**	**UASB + EA*,[b]**	**MBR*,[a]**	**WSP**,[b]**
Performance after Secondary treatment						
Effluent BOD (mg/l)	<20	<30	<10	<20	<5	<40
Effluent SS (mg/l)	<30	<30	<10	<30	<5	<100
Faecal Coliform removal, Log unit	Upto 2<3	Upto 2<3	Upto 3<4	Upto 2<3	Upto 5<6	Upto 2<3
T-N removal Efficiency, %	10-20	10-20	70-80	10-20	70-80	10-20
Performance after tertiary treatment						
Effluent BOD (mg/l)	<10	<10	<10	<10	<10	<10
Effluent SS (mg/l)	<5	<5	<5	<5	<5	<5
Effluent NH_3N (mg/l)	<1	<1	<1	<1	<1	<1
Effluent Total Coliforms, MPN/100 ml	10	10	10	10	10	10
Sludge Treatment: *** Thickener + Centrifuge;** ****Drying Process;** **Type:** **[a] Aerobic;** **[b] Anaerobic-Aerobic;** **[c] Anoxic/Anaerobic-Aerobic;**	ASP: Activated Sludge Process WSP: Waste Stabilization Pond SBR: Sequential Batch Reactor UASB: Upflow Anaerobic Sludge Blanket MBBR: Moving Bed Biological Reactor MBR: Membrane Bio Reactor EA: Extended Aeration					

Source: CPCB Study on Performance Evaluation of Sewage Treatment Plants in India Funded under NRCD, August 2013

Table 50 : Assessment of Technology options for Sewage Treatment Plant

Criteria	ASP	UASB + ASP	SBR	MBBR	MBR	WSP
Performance in Terms of Quality of Treated Sewage						
Potential of Meeting the RAPs TSS, BOD, and COD Discharge Standards	+++	+++	++++	++++	++++	++
Potential of Total / Faecal Coliform Removal	+++	+++	++++	++++	++++	++++
Potential of DO in Effluent	+++	+++	+++	+++	+++	+++
Potential for Low Initial/Immediate Oxygen Demand	++++	++++	++++	++++	++++	++++
Potential for Nitrogen Removal (Nitrification- Denitrification)	+	+	++++	++	++	+
Potential for Phosphorous Removal	+	+	++++	++	++	+
Performance Reliability	++++	++	++	+++	++++	++
Impact of Effluent Discharge						
Potential of No Adverse Impact on Land	++	++	+++	+++	++++	+++
Potential of No Adverse Impact on Surface Waters	+++	+++	+++	+++	++++	+++
Potential of No Adverse Impact on Ground Waters	+++	+++	+++	+++	++++	+++
Impact of STP						
Potential of No Adverse Impact on Health of STP Staff/Locals	++	+	+++	+++	+++	++
Potential of No Adverse Impact on Surrounding Building/Properties	+++	++	+++	+++	+++	++++
Potential of Low Energy Requirement	++	++	++	++	+	++++
Potential of Low Land Requirement	+++	++	+++	+++	++++	+
Potential of Low Capital Cost	++	++	++	++	+	++++
Potential of Low Recurring Cost	++	++	++	++	+	+++
Potential of Low Reinvestment Cost	++	++	++	++	+	+++
Potential of Low Level of Skill in Operation	+++	++	+++	+	+	++++
Potential of Low Level of Skill in Maintenance	+++	++++	+++	++	+	++++
Track Record	++++	+++	+++	+	+	++
Typical Capacity Range, MLD	All flows	All flows	All flows	Smaller	Smaller	All flows
+ : Low; ++ : Medium; +++ : High; ++++ : Very High						
ASP: Activated Sludge Process WSP: Waste Stabilization Pond SBR: Sequential Batch Reactor		UASB: Upflow Anaerobic Sludge Blanket MBBR: Moving Bed Biological Reactor MBR: Membrane Bio Reactor EA: Extended Aeration				

Source: CPCB Study on Performance Evaluation of Sewage Treatment Plants in India Funded under NRCD, August 2013

During operation of the proposed project we have to ensure that the sewage and Trade effluent treatment plants are operated efficiently and continuously so as to achieve the standards prescribed by the CPCB/TNPCB.

Table 51: Disposal Standards of STPs applicable to all modes of disposal

Parameters	Standards (Applicable to all mode of disposal)			
	Mega and Metropolitan Cities	Class I Cities	Others	Deep Marine Outfall
pH	5.5 - 9.0	5.5 - 9.0	5.5 - 9.0	5.5 - 9.0
Bio-chemical Oxygen Demand (BOD)	10	20	30	30
Total Suspended Solids (TSS)	20	30	50	50
Chemical Oxygen Demand (COD)	50	100	150	150
Nitrogen-Total	10	15	-	-
Phosphorus-Total (For Discharge into Ponds, Lakes)	1.0	1.0	1.0	-
Fecal Coliform (FC) (Most Probable Number per 100 mililiter, MPN/100)	Desirable-100 Permissible-230	Desirable-230 Permissible-1000	Desirable-1000 Permissible-10,000	Desirable-1000 Permissible-10,000

Note:
(i). Mega-Metropolitan Cities have population more than 1 crore, Metropolitan Cities-Population more than 10 Lakhs and Class-1 Population more than 1 Lakh.
(ii). All value in mg/l except for pH and Fecal Coliform.
(iii). These standards will be applicable for discharge into water bodies as well as for land disposal/applications.

(Source: NGT (PB) Order dated 30.04.2019 in O.A. No. 1069/2018)

8.3 Waste Management

(a) Mitigation measures during Construction Phase

- The excavated earth and construction debris will be reused for backfilling, internal roads & other paved areas within premises.
- All hazardous waste shall be securely stored, under a shed for eventual transportation and disposal to the authorized dealers.
- The solid waste generation due to workers working at site will be segregated and will be transported and disposed of to waste disposal facility.
- Chemicals/Paints etc. used during construction phase will be stored safely.

(b) Mitigation measures during Operation Phase

Biodegradable and Non-Biodegradable Solid waste, Biomedical waste, Hazardous waste and E-waste generated from the project will be managed as follows

Table 52 : Biomedical Waste Management mode of disposal

S. No.	Description	Mode of Treatment / disposal
1	Human Anatomical Waste (Human tissues, organs, body parts)	Handed over to the bio-medical waste treatment and disposal facility authorized by TNPCB.
2	Microbiology & Biotechnology Waste (wastes from laboratory cultures, stocks or specimens of micro- organisms live or attenuated vaccines, Human cells culture and infectious agents from research laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	Handed over to the bio-medical waste treatment and disposal facility authorized by TNPCB.
3	Waste Sharps (Needles, syringes, scalpels, blades, glass, contaminated waste sharp object)	Disinfection by chemical Treatment, autoclaving/microwaving and mutilation/ shredding and Handed over to the bio-medical waste treatment and disposal facility authorized by TNPCB.
4	Soiled waste (Cotton, dressings, plaster casts, contaminated with blood, body fluids and components etc.)	Handed over to the bio-medical waste treatment and disposal facility authorized by TNPCB.
5	Expired or Discarded Medicines (Pharmaceutical waste - antibiotics, cytotoxic drugs along with glass or plastic ampoules, vials etc.,	Handed over to the bio-medical waste treatment and disposal facility authorized by TNPCB.

Table 53 : Waste Management Plan

S. No.	Type of Solid Waste	Mode of Disposal
1	Bio Degradable Waste*	Shall be treated in Organic Waste Converter (OWC) / Bio-gas Plant & Manure used for gardening
2	Non-Biodegradable Waste	Shall be handed over to authorized recyclers
3	Bio sludge from STP	Used as manure for gardening
4	Biomedical Waste	Shall be handed over to TNPCB authorized Common Bio Medical Waste Treatment and Disposal Facility
5	E-waste	Through authorized recyclers
6	Hazardous Waste	Through authorized recyclers
7	Radioactive waste	Through authorized disposal agency as approved by Atomic Energy (Safe Disposal of Radioactive Wastes) Rules, 1987.

Details of Authorized Recyclers / disposal facilities:

Common Bio Medical Waste Treatment and Disposal Facility

The Ministry of Environment, Forest and Climate Change, Government of India has notified the Bio-Medical Waste Management Rules, 2016. As per the rules, bio-medical waste means any waste, which is generated during diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps. The bio-medical waste generator and the operator of the common bio-medical waste treatment and disposal facility (CBMWTF) shall be responsible for safe handling and disposal of the bio-medical waste. The State Government of Health shall ensure for implementation of the rule in all health care facilities.

SPCB shall issue authorization to the health care facilities and CBMWTF. It shall monitor the compliance of various provisions of the rules. TNPCB has so far authorized 6,261 Private and Government hospitals in the State under the rules. All these hospitals have made agreement with the CBMWTF for the collection, transport, treatment and scientific disposal of the biomedical waste. The CBMWTF consists of autoclave, shredder, incinerator and secured land fill facilities. In Tamil Nadu, 11 CBMWTF are under operation. On an average, daily 43 Tonnes of bio-medical waste is handled by these facilities. There are 3 such facilities in the districts of Tiruvallur, Cuddalore and Tiruppur are under establishment.
(Source: https://tnpcb.gov.in/)

Engagement of CBMWTF during operation phase:

1. Tamil Nadu Pollution Control Board (TNPCB) has issued consent to 11 facilities for treatment and disposal of Bio-medical waste and the list is provided in Appendix A.
2. The facilities can operate in the regions as specified in their Consent to Operate (CTO) issued by TNPCB and the region covered by individual facility and the maximum quantity of bio-medical waste authorized to handle are provided in the Table 1 in Appendix A.
3. AIIMS has to contact the authorized CBMWTF for their region to execute the agreement for treatment and disposal of proposed bio-medical waste (i.e. M/s. Ramkey Energy and Environment Ltd., Undurmikidakulam, Virudhunagar District. Authorized capacity – 4,000 kg/day). Please refer S. No. 8 of Table 1 in Appendix A.
4. If the authorized CBMWTF cannot handle the proposed quantity, AIIMS has to contact TNPCB along with the letter produced/submitted by CBMWTF.
5. TNPCB will give necessary directions to contact other available regional CBMWTF. It may be noted that AIIMS cannot contact the other CBMWTF directly without the TNPCB directions.
6. AIIMS has to pay the initial scrutiny fee based on the number of the beds to be operated during the signing of agreement.
7. Any other further clarifications shall be clarified with the CBMWTF helpline number as provided in Table 2 of Appendix 3.

E-Waste Dismantlers/recyclers

The Ministry of Environment, Forest and Climate Change, Government of India notified the E-Waste Management Rules, 2016. This rule will come into force from the 1st day of October, 2016. Electronic waste or e-waste comprises old, end of life electrical and electronic appliances such as telephones, cellular telephones, computers, laptops, television sets, refrigerators, washing machine, air-conditioners, fluorescent and other mercury containing lamps etc., The rules apply to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment.

As per the rules, the producer of the electrical and electronic equipment shall be responsible for collection and channelization of e-waste generated from the 'end-of-life' of their products under Extended Producers Responsibility. State Pollution Control Board shall grant and renew authorization to the manufacturers, dismantlers, recyclers and refurbishers. SPCB shall monitor on the compliance of Extended Producer Responsibility by the producer of electrical or electronic equipment for channelization of e-waste to ensure environmentally sound management of such waste. SPCB shall conduct random inspection of dismantler or recycler or refurbisher, maintain online information regarding authorization granted, implementation of programmes to encourage environmentally sound recycling, and action against violations of the rules. TNPCB has issued authorization for 24 units (Dismantlers 22, Recyclers 1,Refurbishers 1) under the e-Waste (Management & Handling) Rules.

List of valid authorised e-waste dismantlers, recyclers, refurbishers in Tamil Nadu is enclosed herewith as Appendix 3.

8.4 Soil Contamination

a) **Mitigation measures during Construction Phase**

- A Separate raw material handling yard shall be demarcated. This will prevent the contamination of the soil due to the spillage of the construction materials.
- Cement shall be separately stored under cover in bales.
- The raw material handling yard will be located within the project site and separated by enclosures/barricades. This will keep the working area clean and reduce the soil contamination.
- During excavation, top soil excavated will be stored separated and used for greenbelt development within the project site.
- Spillage of construction materials was avoided to prevent soil contamination and deterioration on soil quality.
- Spillage of oil, diesel etc. was minimized to avoid soil contamination.

b) Mitigation measures during Operation Phase

- By proposing proper municipal solid waste management system for waste collection, segregation thereby avoiding the leachate into the soil.

- The waste oil from the D.G set will be properly collected and stored in leak proof container thereby avoiding the spillage and it will be sold to authorized recyclers.
- Proposed rainwater harvesting will minimize runoff from the site.

8.5 Noise and Vibration

(a) Mitigation measures during Construction Phase

All machineries to be used for construction purpose shall be of highest standard of reputed make and compliance of noise pollution control norms by these equipment's will be emphasized by the manufacturer.

- Acoustic laggings and silencers will be used in equipment's wherever possible.
- Feasibility of putting up acoustic enclosure / temporary barrier around areas with high noise levels will also be constructed and maintained.
- Construction activities that will generate disturbing sounds will be restricted to day time operations.
- Workers operating equipment generating noise levels greater than 80 dBA continuously for 8 hours or more will use earmuffs. Workers experiencing prolonged noise levels of 70 – 80 dBA will wear earplugs.
- The construction activities will be restricted to the daytime and no construction will be practiced during night.
- Barricades of adequate height will be provided around the construction site to confine noise within the site.
- The noise generated from the construction equipment's shall be reduced through proper maintenance of all the equipment which are involved in construction activities, confining the construction activities only during the day time and providing barricades all around the project area.
- Noise control systems such as equipment foundation pads, dampeners, silencers and acoustic enclosures shall be used for individual units as per the requirement to minimize the noise & vibration.

(b) Mitigation measures during Operation Phase

- DG set should be installed along with acoustic enclosure as per CPCB standards.
- Noise barrier / compound wall will be constructed along periphery of the project site.
- Properly designed internal road network will facilitate in free flow of traffic movement.
- Honking will be discouraged.
- Green belts and landscaping shall act as noise buffer.
- All the necessary noise protective equipment will be supplied to workmen operating near high noise generating sources like DG set.

The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side. If the actual ambient noise is on the higher side, it may not be possible to check the

performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise levels (preferably in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, and then averaged. (Source: www.cpcb.nic.in)

8.6 Ground Subsidence

As stated in the previous chapter, the project site is a flat terrain and there is no possibility of ground subsidence. However, during the excavation for basements and foundation the following mitigation shall be implemented:

- Pile Foundation can be adopted to avoid deep excavations which in turn avoid accidents.
- Protection from Falls, Falling Loads, and Mobile Equipment
- Install barricades
- Use hand / mechanical signals
- Grade soil away from the excavation
- Fence or barricade trenches left overnight
- Use a flagger when signs, signals, and barricades are not enough protection

To protect employees from these hazards, take the following precautions:

- Keep materials or equipment that might fall or roll into an excavation at least 2 feet from the edge of excavations, or have retaining devices, or both.
- Provide warning systems such as mobile equipment, barricades, hand or mechanical signals, or stop logs, to alert operators of the edge of an excavation. If possible, keep the grade away from the excavation.
- Provide scaling to remove loose rock or soil or install protective barricades and other equivalent protection to protect employees against falling rock, soil, or materials.
- Prohibit employees from working on faces of sloped or benched excavations at levels above other employees unless employees at lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.
- Prohibit employees under loads that are handled by lifting or digging equipment. To avoid being struck by any spillage or falling materials, require employees to stand away from vehicles being loaded or unloaded. If cabs of vehicles provide adequate protection from falling loads during loading and unloading operations, the operators may remain in them.

8.7 Offensive odour

During construction phase, the source of offensive odour is negligible. Use of Low / no VOC content paints and varnishes shall be employed.

However, during operation phase following mitigation measure to be taken to minimize the offensive odour/nuisance.

- Strictly follow standard operating procedures / operational manual for operation and maintenance of STP & ETP.
- The STP/ETP area should have proper ventilation for circulation of air if the STP/ETP is proposed underground.
- Ensure that operating staff is properly trained, and have clear understanding of odour issues vis-à-vis its related with operational practices.
- In case of power failure, ensure that continuous operation of STP & ETP by using DG set.
- Conduct periodic H_2S monitoring at STP & ETP area. Or install a H_2S sensor for live monitoring.
- Tree plantation and landscaping along the periphery of the STP & ETP site to act as a barrier and to prevent bad odour.
- Biodegradable and Non-Biodegradable Solid waste, Biomedical waste, Hazardous waste and E-waste generated from the project will be managed as given in section 8.3.

8.8 Bottom Sediment

As stated in the previous Chapter, there is no possibility of impact on bottom sediment due to the project proposal.

8.9 Protected areas

As stated in the previous Chapter, there are no protected areas within 15 Km of project site. Hence, there will not be any impact on the protected areas due to the proposed AIIMS Campus.

8.10 Flora / Fauna diversity

The mitigation measures for the impact on the flora / fauna diversity:

- The following activities shall be done in project site to avoid on-site disturbances:
    - The entire project site can be divided into zones for construction phase
    - The construction area and the vehicle track shall be separately earmarked and the same shall be strictly followed
- The trees of native species shall be planted within the project site to restore the flora / fauna diversity
- A dedicated team for greenbelt development shall be employed during the operation phase of the project to plant and maintain the trees within the project site.
- The criteria for selection of species for plantation are that the species should be indigenous and suited for the soil and rainfall of the region and should need minimal attention after the maintenance period.
- Adequate protection for the plants, necessary care and monitoring should be carried out to ensure their growth.

8.11 Hydrology

To augment the existing ground water table, rainwater harvesting system shall be provided based on the soil investigation report.

8.12 Topography & Geology

The change in the topography will be due to the construction of buildings.

Mitigation measures

It is essential to avoid disturbance to the site by retaining the natural topography of the site or design the landscape / greenbelt with at least 15% to 25% of the site area. It may be note that the landscaping over the built structures and potter plants are considered as greenbelt area, turf design on site so as to conserve water

- reduce the water demand for greenbelt development through water efficient management techniques.
- Turf / shrubs / bushes may be segregated into independent zones based on watering needs.

8.13 Involuntary resettlement

As discussed in the Chapter 7. The project site is vacant and there is no involuntary resettlement involved in the proposed project.

8.14 Poverty

As discussed in the Chapter 7. No possible impact is expected on poverty due to proposed project to the surrounding peoples.

8.15 Ethnic minority and indigenous people

As discussed in the Chapter 7. No impact is anticipated due to proposed project on ethnic minority and indigenous people.

8.16 Local Economy

The project proposal will have positive impact on the local economy. Thus, there is no need for mitigation measures

8.17 Land use and utilization of local resources

The project site is vacant the land use within the project site shall be done considering the following in order to minimize the impact on land use:

- The Master plan shall be drawn considering 15-20% of plot area as vacant area.
- The paved areas shall be limited to 30% of project site.
- The ground coverage of buildings and Floor Space Index area shall be strictly followed as per the rules prescribed by the local town and country planning acts.

The materials required for the construction shall be sourced through local market only, in order to avoid mass movement of vehicles.

8.18 Water Usage

During construction phase, Cement mixtures of less water consumption shall be preferred to reduce the quantum of water requirement.

The following are the mitigation measures during operation phase:

- Fixtures for wash basin, toilet flushing and drinking water will be of low flow type by adopting the use of aerators / pressure reducing devises / sensor based control in order to control the water usage.
- Recycling of treated water from STP & ETP within the campus. Dual plumbing lines for grey water use.

8.19 Existing Social Infrastructure and service

- Traffic congestion near the entry and exit points from the roads adjoining the proposed project site shall be avoided.
- Parking shall be fully internalized and no public space should be utilized.
- Parking plan to be as per DTCP norms.
- The traffic department shall be consulted and any cost effective traffic regulative facility shall be met before commissioning.
- As part of the Project, 1% of the project cost need to allocate as Corporate Environmental Responsibility (CER) proposal as per office memorandum of MoEF&CC dated 01.05.2018 and should carry out various social activities in nearby surrounding villages.

8.20 Social Institutions such as social infrastructure and local decision-making institutions.

As discussed in the Chapter 7, there is no possible impact on the existing social infrastructure and local decision-making institutions due to proposed project.

8.21 Maldistribution of damage and benefit

There is no possible impact on the maldistribution of damage and benefit due to the proposed project.

8.22 Local conflict of interest

As discussed in chapter 7, No impact is anticipated on the local conflict of interest due to the proposed project.

8.23 Cultural heritage

As stated in chapter 7, no cultural heritage structures were found within 5 km radius of project site. Thus, there will be no possible impact on cultural heritage due to proposed project.

8.24 Landscape

The alteration of existing landscape will comprise of ground coverage of buildings, roads and pavements. The remaining areas shall be kept vacant and the open areas shall be planted with the trees of native species which will acts as a noise barrier and pollution control. The greenbelt development plan shall be implemented as follows. The project proposal attracts Environmental Clearance and as per the directions of SEAC & SEIAA, Tamil Nadu it is mandatory to provide 15% of plot area as greenbelt area. The following native species shall be planted in the earmarked area.

Table 54 : List of Species recommended for greenbelt

S.No.	Botanical Name	Common Name	No. of trees
1.	Azadirachta indica	Neem tree	Number of trees should be as per MoEF&CC Guidelines on Green Cover vide Notification dated 14th Nov 2018 i.e. 1 tree per 80 Sq.m of land area
2.	Ficus religiosa	Peepal tree	
3.	Polyalthia longifolia	Mast tree	
4.	Mimusops elengi	Bullet wood tree	
5.	Albizial ebbeck	Lebbek tree	
6.	Pongamia pinnata	Pongam tree	
7.	Thespesia populnea	Portia tree	
8.	Calaphyllum inophyllum	Punnai tree	
9.	Syzygium cumini	Jamun tree	
10.	Madhuca longifolia	Iluppai tree	

- Monitor the progress of planting and maintenance of plantations on continuous basis.
- The green belt maintenance shall include watering, manuring, fertilizing, plant protection for pests and diseases, sweeping, weeding, and disposal of garden refuse, cultivation and cutting of edges, pruning and clipping of hedges, etc. and stacking, minor repair works and all other landscape operations necessary for the proper growth for horticulture features and maintaining them in a healthy way.

8.25 Gender

No possible impact is anticipated as discussed in Chapter 7.

8.26 Children's rights

No activity is planned in the proposed project during both construction and operation phase that will violate the children's rights. Thus, there is no possible impact on the gender due to the proposed project.

8.27 Infectious disease and HIV/AIDS

Mitigation measures during Construction Phase

The construction project may create potential risks for the spread of HIV/AIDS among construction workers, contractors, and local communities due to inflow of construction workers into the project site. The contractors shall be vigilant to detect workers showing symptoms of communicable diseases. Health checkup of the contract labors shall be done/ recorded regularly. All illness shall be reported and recorded.

The awareness program should be conducted periodically about HIV/AIDS and STDs among construction workers, contractors in project site and local communities in the project area.

During Operation Phase

Poor sanitation will cause diseases such as cholera, diarrhoea, dysentery, hepatitis A etc., Sanitation is the process of keeping places clean and healthy, especially by providing a clean water supply and proper sewage system to prevent human contact with faeces. All the human excreta and liquid wastes from all sanitation facilities including toilets must be disposed of safely. Maintaining network-based sewerage systems, recycling and reusing of treated waste water, promoting proper disposal and treatment of sludge from on-site installation (Sewage Treatment Plant and Effluent Treatment Plant), ensuring safe collection of sewage, effluent, and their subsequent disposal after treatment are some of the measures of good sanitation.

Inadequate biomedical waste management will cause adverse effect to health and environment. Hence biomedical waste should be collected, segregated, treated and disposed as per Bio-medical Waste management rules 2016.

8.28 Occupational Health (including work safety)

Mitigation measures during Construction Phase

During construction phase of the proposed project, the employers are subjected to Health and Safety Risks.

- To eradicate the Health and Safety risks, Personal Protective Equipment's will be provided
- Ensuring good housekeeping and cleaning operations
- Regular health and monitoring of workers.

The objective is to ensure health and safety of the workers during construction, with effective provisions for the basic facilities of sanitation, drinking water, safety of equipment's or machinery etc. Following are some of the recommendations to be followed:

- Comply with the safety procedures, norms and guidelines (as applicable) as outlined in National Building Code of India, Bureau of Indian Standards
- Provide clean drinking water to all workers
- Provide adequate number of decentralized latrines and urinals to construction workers.
- Guarding all parts of dangerous machinery.
- Precautions for working on machinery.
- Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- Durable and reusable formwork systems to replace timber formwork and ensure that formwork wherever used are properly maintained.
- Ensuring that walking surfaces or boards at height are of good quality and are provided with safety rails or belts.
- Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- Provide sufficient and suitable light for working during night time.

Sanitation Facilities-Proper on-site Sanitation facilities will be provided for the laborers. The wastewater generated during construction phase will be treated in the Septic Tank and Soak Pit of adequate capacity. Health, Safety and Sanitation will be maintained at Labour Camp. It is expected that the project of this nature would involve employment of large quantity of construction workers over the entire construction period. Necessary steps to maintain the sanitation and health standards of the construction workers will be adopted as a part of the project and will comply with the Central Building and Other Construction Workers Act of 1996. It is suggested that the contractor will take following measures for safeguarding the construction workers.

- The contractor will install adequate toilets and bath rooms at the construction camp to cater to the requirements of the workers;
- All organic waste generated at construction site will be disposed to authorized agencies;
- Regular health check-ups of construction workers will be organized at site and labour camp.

Mitigation measures during Operation Phase

During operation phase

Fire safety is an important norm that needs to be considered during the construction of a hospital. Compared to the general buildings, it is a tough task to evacuate the people from the hospitals. It is unfortunate there are still a few hospitals in which the fire safety is still the words written on the water surface.

Hospitals and other healthcare facilities need to focus more on the easy and safe evacuation methods. The healthcare practices are responsible for the safety and security of the people inside the hospital and they are expected to adhere to the legally approved fire safety measures.

The Emergency Management Plan (EMP) should be kept current so that it stands the unexpected occurrence of a fire in a hospital. Here are a few fire safety measures of a hospital that are proven to be effective.

Establish the Incident Command Structure – Communication has vital importance in reducing the damage caused by a fire accident. Establish a functional incident command structure that has groups and subgroups. These groups and subgroups form a tree of communication and follow the instruction of the group leader.

Instructions for a Fire Safety Management Team – Involving the Fire Safety Management team in the hospital planning and opening the gates of communication with this team well advance will reduce the damage caused by the fire accident. Keep the communication loop always open with the Fire Safety Management team will keep the damage to a minimum.

Fire Safety Evacuation Aids – Hospital evacuation is a challenging task and the fire safety evacuation aids will help you in this regard. There are many types of evacuation aids available in today's market. Equip your hospital with evacuation mats and sheet that could hold the patient firmly while sliding to a safer location.

Fire Fighting Equipment in Check – The firefighting equipment that includes smoke detectors, fire alarms, emergency exit signals, fire extinguishers and other firefighting equipment should always be in check. Conduct a performance check while doing the fire drills to ensure the responsive in the face of a danger.

Mock Drills and Fire Safety Training – This aspect has vital importance in reducing the damage and saving lives during a fire accident. Ensure all your staff members are undergoing the fire safety training programs and participating in the mock drills. This not only creates a responsive and reliable team in case of a fire but also establishes a safe and secured atmosphere that prevents fire accidents.

8.29 Accidents

Mitigation measures

- Adequate fire protection equipment and rescue arrangements should be made as per the prescribed standards by Fire department/NBC.
- The regular fire drills will be conducted to create awareness among workers/occupants.
- Proper and free approach road for fire-fighting vehicles upto the buildings and for rescue operation in the event of emergency shall be made.
- Lightning arrester shall be properly designed and installed at top of the building and where ever is necessary.

- To resist the earthquake, the structural design of proposed building shall be as per IS: code 875 and 1893-2002 "Criteria for Earthquake Resistant Design of Structures.

8.30 Cross-border impact, climate change

Mitigation measures

Efficient use of resources –energy, water, raw materials and less carbon intensive practices as listed below will reduce the GHG emissions of the project.

- Fly-ash blocks should be used as building material in the construction as per the provision of Fly Ash Notification of September, 1999 and amended as on 27th August, 2003 and Notification No. S.O. 2807 (E) dated: 03.11.2009

- Use of glass shall be reduced up to 40 % to reduce the electricity consumption and load on air conditioning. If necessary, high quality double glass with special reflection coating shall be used in windows.

- Roof should meet prescriptive requirement as per Energy Conservation Building Code by using appropriate thermal insulation material, to fulfil the requirement.

- Opaque wall should meet prescribed requirement as per Energy Conservation Building Code which is mandatory for all air conditioned spaces by use of appropriate thermal insulation material to fulfill the requirement.

- All norms of Energy Conservation Building Code (ECBC) and National Building Code, 2005 as energy conservation have to be adopted Solar lights shall be provided for illumination of common areas.

- Application of Solar energy should be incorporated for illumination of common areas, lighting for gardens and street lighting. A hybrids system or fully solar system for a portion of the apartments shall be provided.

- Energy conservation measures like installation of CFLs/TFLs for lighting the areas outside the building should be integral part of the project design and should be in place before project commissioning.

- The building should be energy efficient, provide enough ventilation and adhere to sustainable building, green building norms and energy saving standards.

CHAPTER 9
Monitoring Plan

9. Monitoring Plan

Table 555 : Monitoring Plan

Item	Sub-item	Survey point	Frequency of monitoring and reporting	Responsible agency
Construction Phase				
Ambient Air Quality	PM_{10}, $PM_{2.5}$, SOx, NOx and CO	Near the construction sites	Once in a month	Contractor
Stack Emissions from DG set	PM, SOx, NOx, HC and CO	Near the construction sites	Once in a month	Contractor
Ambient Noise Level	Noise level in dB (A)	Near the construction sites	Once in a month	Contractor
Soil Quality	EC, pH, Texture, N, P, K, SAR and other nutrient parameters	Near the construction sites	Once in a month	Contractor
Water quality	Drinking water parameters	All the wells in the monitoring area	Once in a month	Contractor
Operation Phase				
Ambient Air Quality	PM_{10}, $PM_{2.5}$SOx, NOx and CO	Boundary of project site	Once in a month (half year after construction)	Contractor
Stack Emissions from DG Set	PM, SOx, NOx, HC and CO	Stack outlet	Once in a month (half year after construction)	Contractor
Ambient Noise Level	Noise level in dB (A)	Boundary of project site	Once in a month (half year after construction)	Contractor
Water quality(surface/ underground)	BOD, COD, TDS, Bacillus coli, Nitrate, Phosphate, oil, Bacteria	Wells in the monitoring area	Once in a month (half year after construction)	Contractor
Treated sewage	pH, TSS, BOD, COD and Fecal Coliform (FC)	STP / ETP Outlet (UV Outlet)	Once in a month (half year after construction)	Contractor

CHAPTER 10
Stakeholder Meeting

10. Stakeholder consultation meeting

During the baseline study, stakeholder interaction with public regarding the project proposal was carried out in the month of July 2020. A group of people residing in the immediate vicinity of project site were selected for the interactions. The interactions consisted of gathering their personal profile and recording their opinions of the project proposal.

Public Interaction:

As per the JICA guidelines, it is mandatory to conduct a public consultation for the project based on the initial details. But due to the COVID-19 situation it is mandated by the Government of Tamil Nadu to avoid public mass gatherings. Hence after detailed discussions with the JICA team it was decided to carry out the interactions on a face to face basis in the month of October 2020. Sample survey selection was based on the age group and educational qualifications.

Selection of village for public interaction:

The surroundings villages which would be impacted the most by the project were selected for public interaction. In every village people residing in different Landuse - residential, commercial, schools and the government representatives were interviewed by us. The survey photographs showing the interactions are given below.

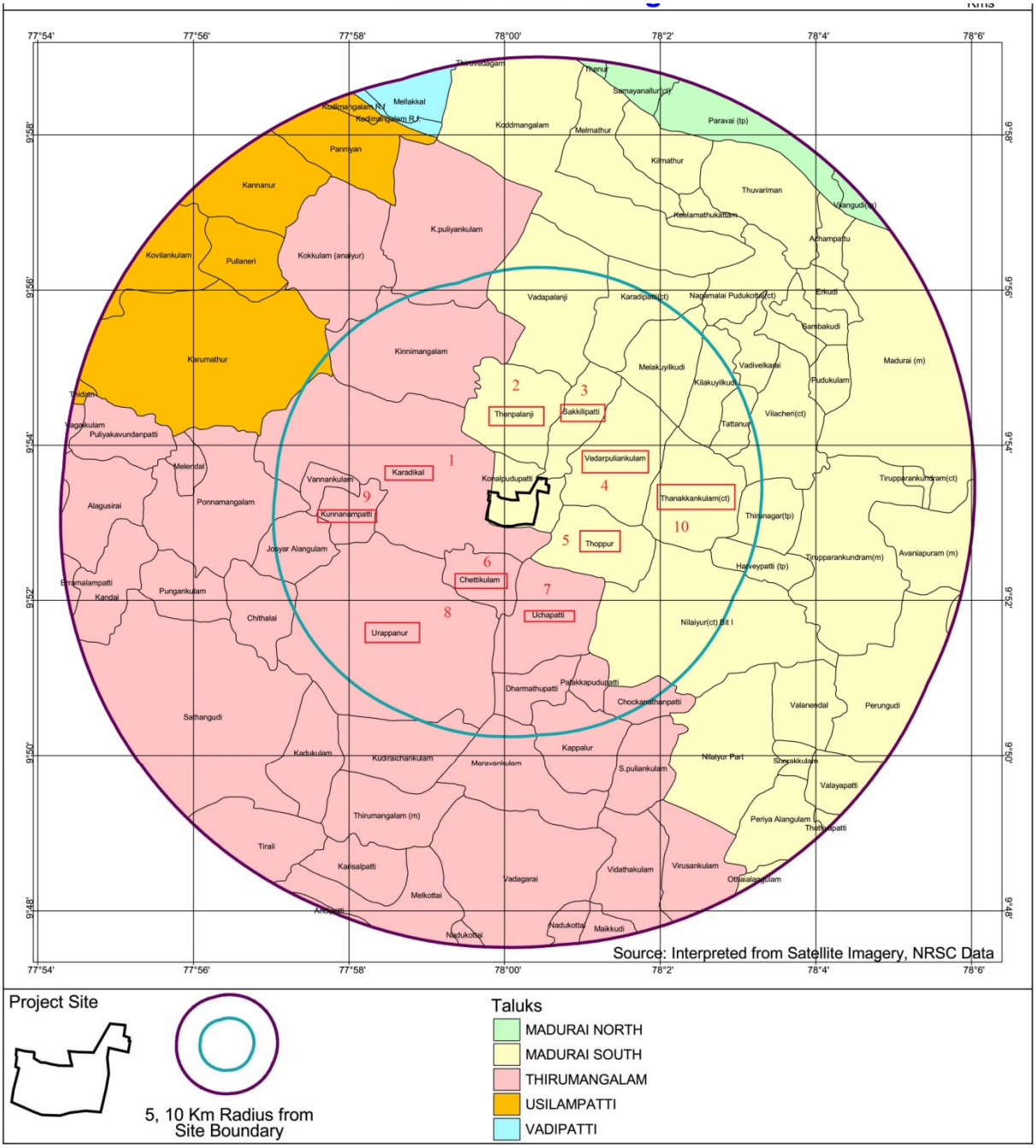


Figure 52 : Map showing the villages selected for public interaction

Figure 53 : Photographs showing the public interaction with the local villagers

Presentation of results:

Public were very interested about the project proposal and were looking forward to start the construction of the AIIMS campus. Most of the people supported the proposal due to the introduction of the public transport system which is planned during the operation phase of the project. The major opinion/comments are as follows:

- There were many graduates looking forward to employment opportunities. Each village wanted priority to be given to them for the same.
- Villagers are facing water scarcity for agricultural purposes (nearly 2 months in year).
- Groundwater table has gone down during the past 2 years.
- A proper management plan should be implemented for bio-medical waste.
- The road widening completed seemed to be sufficient to carter the traffic during the operation of the project.
- At present there are no local transportation available to reach the AIIMS site, hence the public transport network should be provided.
- It is proposed to have an entry and exit in the southern side of the project. The villagers residing in the northern side have to take a longer route to reach the entrances. Hence, they requested for another entry and exit in the northern side of the project.
- The Environmental Management Plan (EMP) shall be implemented to reduce the impact on air, water and soil environment.
- Agriculture is the major occupation in the surrounding villages. After the establishment of AIIMS the agriculture should be promoted. Or at least ensure that the existing agricultural activities should not be affected.

All collected comments are attached in Appendix B.

Chapter 11
Conclusion

11. Conclusion

A preparatory survey for the Environmental & Social consideration towards the development of AIIMS campus at Madurai was carried out. The requisite points in the provided TOR have been comprehensively covered in the report.

Appendix A
List of recyclers/disposal facility for waste management

Table 1: List of common bio-medical waste treatment facility under operation in TamilNadu

Sl. No	Name and address of the facility	Regions covered	Capacity kg/day
1	M/s. Aseptic System Bio Medical Waste Management Co., Pappankulam, Tirunelveli District.	Tirunelveli Dt, Thoothukudi Dt, Kanniyakumari Dt.	1650
2	M/s. Kovai Bio Waste Management Pvt Ltd., Orattukuppai, Coimbatore District.	Coimbatore, Nilgiris.	1450
3	M/s. Ken Bio Links Private Limited, Kandipedu, Katpadi Taluk, Vellore District.	Vellore Dt, Vaniyambadi, Thiruvannamalai Dt.	7660
4	M/s. Medicare Enviro Systems, Sengipatti, Thanjavur Taluk, Thanjavur District.	Thanjavur Dt, Thiruvarur Dt, Trichy Dt, Nagapattinam Dt, Karaikal, Pudukottai Dt, Perambalur Dt, Ariyalur Dt, Sivagangai Dt.	1800
5	M/s. G. J. Multiclave (India) Pvt Ltd., Thenmelpakkam, Chengalpattu Taluk, Kancheepuram District.	Part of Chennai, Kancheepuram and Tiruvallur Dt.	6160
6	M/s. Neat and Clean Service Squad, Muthuvayal, Ramanathapuram District.	Ramanathapuram Dt.	21
7	M/s. Ramkey Energy and Enviornment Ltd, Thangayur, Salem District.	Salem, Namakkal, Erode, Dharmapurai, Krishnagiri, Karur	1500
8	M/s. Ramkey Energy and Environment Ltd., Undurmikidakulam, Virudhunagar District.	Madurai Dt, Virudunagar Dt, Dindigul Dt, Theni Dt & Ramanathapuram Dt.	4000
9	M/s. Society for Bio Medical Waste Management, Coonoor , The Niligiris Distict.	Nilgiris Dt.	766
10	M/s. Tamilnadu Waste Management Ltd., Kinnar village, Maduranthakam Taluk, Kancheepuram District.	Chennai (North), Part of Kancheepuram Dt, Tiruvallur Dt, Cuddalore Dt, Villupuram Dt.	6660
11	M/s. Techno Therm Industries, Orattukuppai, Coimbatore District.	Coimbatore, Pollachi, Udumalpet, Mettupalayam, Tiruppur, Sathyamangalam.	2500

(Source: https://tnpcb.gov.in/)

Table 2 : Helpline Numbers of Common Biomedical Waste Treatment Facilities

S.No.	Name of the CBMWTF	Nodal Person	Contact Number
1.	M/s. G. J. Multiclave (India) Pvt Ltd, Thenmelpakkam, Chengalpattu Taluk, Kancheepuram District.	Mr.P.Sivakumar	8754597155
2.	M/s. Tamilnadu Waste Management Ltd., Kinnar Village, Maduranthagam T.K. Kancheepuram District	Mr. P.A. Venkatachalapathy	9677122704
3.	M/s. Medicare Enviro Systems, Sengipatti, Thanjavur Taluk, Thanjavur District	Mr.Velmurugan	9600288998
4.	M/s. Ken Bio Links Private Ltd., Kandipedu, Katpadi Taluk, Vellore District.	Mr. Shiva	9962311011
5.	M/s. Ramky Energy and Environment Ltd, Thangayur, Salem District.	Mr. Nizar Ahmed	9677122708
6.	M/s. Teknotherm Industries, Orattukuppai, Coimbatore District.	Mr. S.Sudhakar	9626822000
7.	M/s. Aseptic System Bio Medical Waste Management Co., Pappankulam,Tirunelveli District.	Mr. Murugan	7373715180
8.	M/s. Ramky Energy and Environment Ltd., Undurmikidakulam Virudhunagar District.	Mr. Govindan	9677122721

(Source: https://tnpcb.gov.in/)

Table 3: List of Valid Authorised E-Waste Dismantlers in Tamil Nadu

S.No	Name of the Dismantlers	Authorisation validity
1	M/s.A.K.Enterprises, No:12, Chakarapani St, Velacherry, Chennai-32. Contact: 9176664862 Email: akenter06@gmail.com	15.03.2021
2	M/s.Abishek Enterprises S.F.No.2G,2NP,Ambattur, Chennai – 600098. Contact No: 9884057878 Email: enterprisesabishek@gmail.com	31.03.2021
3	M/s.AER Worldwide india Pvt Ltd, No.774,Elandandheri ,sadayankuppam village, near andarkuppam Check Post, Manali New Town, Chennai – 600103. Contact No: 9940105999 Email: jkumar@aerworldwide.com, akaja@aerworld.com	25.11.2024
4	M/s. Earth Sense Recycle Private Limited S.F.No. 247, Thenmelpakkam Village, Chengalpattu Taluk, Chengalpattu District. Contact: 9962222459 Email: ewastechennai@earthsense.in	05.12.2024
5	M/s. Enviro Metals Recyclers Private Limited Pvt Limited Aluminium Division S.No. 104 and 106, Ezichur Village,Sriperumbudur Tk,Kancheepuram District. Contact: 9789968030 Email: anbu@ensenviro.com	03.12.2024
6	M/s. G S ENTERPRISES S.F NO:254/2A2A, Mevalurkuppam Village, Sriperumbudur Taluk,Kancheepuram Dist 602105. Contact: 9789092500 Email: gsenterprises@gmail.com	27.01.2024
7	M/s. Green E Waste Private Limited, S.F.No. 294/pt, Ayanambakkam Village, Poonamallee Taluk, Tiruvallur District. Contact: 9566214845 Email: stephen.greenewaste@gmail.com	14.06.2025
8	M/s. Green Era Recyclers, S.F.No. 344/2, Kavundampalayam Village, Coimbatore North Taluk,Coimbatore District – 641 025. Contact: 99656 64526,83002 23526 Email: prasanth@thegreenera.in	31.03.2022
9	M/s. Green India Recyclers, SF.No. 26/1B, Kovilpalayam Road, Soolakkal Village, Kinathukadavu Taluk, Coimbatore – 642110. Contact: 9003491034,9894940304 Email: info@greenindiarecyclers.com	07.12.2022
10	M/s. JADG India E-Waste Recyclers Pvt.Ltd, SF No.256/1A1, Kollur Village, Kilikodi Post, Ponneri Taluk, Tiruvallur-District	16.03.2022

	- 601206. Contact: 7373919322 Email: jadgewaste@gmail.com	
11	M/s Leela Traders, S.F.No. 41/1 part, Cuddaloor Village, Chengalpattu Taluk, Chengalpattu District. Contact: 748888110 Email: leelatraders1@gmail.com	31.03.2023
12	M/s.Micro E – Waste Recyclers, 3/3B, Chennai Bye Pass road, Senthaneer puram, Trichy – 620 004. Contact: 9443141600 Email: microrecyclers@yahoo.com	17.08.2022
13	M/s.MG Traders, No. 86, Nehru Street, Teachers colony, Ambattur, Chennai - 600053.	12.01.2024
14	M/s. Ponniamman Enterprises, S.F.No. 216/3, Tiruvallur Village, Tiruvallur Taluk, Tiruvallur District. Contact: 9677462993 Email: ponniammanenterprises@gmail.com	31.03.2023
15	M/s.Punithan Enterprises UNIT-II, No.113/19 Part, Rajiv Nagar, Perinjambakkam, Gundu Perumbedu Post SPR taluk, Kancheepuram Dt 601301. Contact: 9840611027 Email: punithanenterprises@gmail.com	31.03.2021
16	M/s.R.M Computers , 405/6,T.H.Road,G.C.K Complex 1st floor Ambattur Chennai – 600098. Contact: 9094032959 Email: Computers-associater.geid@gmail.com	04.12.2024
17	M/s. S.P.P. Enterprises, S.No.184-4C, Mambakkam Village and Post, Sriperumbudur Taluk, Kancheepuram District. Contact: 7299917239 Email: sppenterprices@gmail.com	12.07.2023
18	M/s. Shri Raam Recycling, No.DP-29, SIDCO Industrial Estate, SIPCOT Industrial Complex, Gummidipoondi Taluk, Tiruvallur District – 601201. Contact: 9884499191 Email: info@shriraamrecycling.com	06.12.2022
19	M/s. Southern alloys, S.F.No. 61p & 62p Plot No. S – 10 & 106, Putlur Village, Tiruvallur Taluk, Tiruvallur District. Contact: 9500038861 Email: southernalloys@rediffmail.com	06.09.2020
20	M/s. SEZ Recycling, TP-7, IVth Avenue, Mahendra World City Developers Limited, Industrial Estate, S.F.No. 42/1, 43,44, Thenmelpakkam Village, Chengalpattu Taluk, Kancheepuram District. Contact: 9790711555 Email: akshay@sezrecycling.com	22.11.2022

21	M/s. Trishyraya Recycling Private Limited, Plot No. 7, Phase – I, MEPZ-SEZ, Tambaram, Chennai – 45. Contact: 9840897125 Email: subash.warrier@simsmm.com	03.07.2024
22	M/s.Tritech Systems, S.F.No.165,Porur village, Maduravoyal Taluk, Chennai -600116. Contact: 9003077866 Email: Tri-abdullah@yahoo.com	16.08.2022
23	M/s. Virogreen India Pvt. Ltd, No.297/1B2, No.49, Pappankuppam Village, SR Kandigai Road, Gummidipoondi Taluk, Tiruvallur-601201. Contact: 9940615444 Email: selvam@virogreen.in	31-03-2021
24	M/s. WORLD SCRAP RECYCLING SOLUTION, S.F.No.351/7, Beemanthangal Village,Sriperumbudur Taluk,Kancheepuram District. Contact: 8778458025 Email: worldscraprecycling@gmail.com	24.02.2021

Table 4: List of Valid Authorised E-Waste Recyclers in Tamil Nadu

S.No	Name of the Recyclers	Authorisation validity
1	M/s. TES-AMM INDIA PVT LTD, Plot No. A18, SIPCOT Industrial Growth Centre, Oragadam,Sriperumbudur Taluk, Kancheepuram Dist. Contact: 9500064318 & 9176755506 Email: kishorekumar.s@tes-amm.net	14.08.2021
2	M/s. Victory Recovery and Recycle Technologies India Private Limited, S.F.No. Kannur Village, Tiruvallur Taluk & District. Contact: 9444917895 Email: ravimangalam@victoryrecovery.in	30.08.2022

Table 5: List of Valid Authorised E-Waste Refurbishers in Tamil Nadu

S.No	Name of the Refurbishers	Authorisation validity
1	M/s.Ecosible Recyclers Pvt Ltd, No.154A/B,8th Mahatma Gandhi Road, Tass Industrial Estate, Ambattur,Chennai – 600098. Contact: 9500101738 Email: Ravi.shastry@ecosible.com	31.03.2023

Appendix B: Record of Public Consultation

Table 1: Public Opinion and Comments collected at Kunnanampatti on 20th October 2020

No.	Name of person	Gender	Age	Address	Opinion/Comments
1	Alagammal	Female	37	West Street, Kunnanampatti, Madurai	Our village need this hospital. Hospital should prevent spread of communicable disease.
2	B. Mauthan	Male	50	West Street, Kunnanampatti, Madurai	We welcome this hospital.
3	Thurumbuthevar	Male	58	East Streer, Kannanampatti, Madurai.	We welcome this hospital to our village. Southern district people will get good medical facility.
4	Abinaya	Female	22	No.2/52, East Street, Kunnanampatti, Madurai.	We welcome this hospital.
5	Kannan	Male	43	No.2/46A, East Street, Kunnanampatti, Madurai.	We welcome this hospital.
6	K. Pandiammal	Female	35	No.02, South Street, Kunnanampatti, Madurai.	We welcome this hospital.
7	R.Kavipriya	Female	18	South Street, Kunnanampatti, Madurai.	We welcome this hospital.
8	Irulayee	Female	65	East Streer, Kannanampatti, Madurai.	We need this hospital. We welcome this hospital.
9	Velammal	Female	40	East Streer, Kannanampatti, Madurai.	Doctors should visit our villages.
10	P.Sivaraj	Male	27	Kunnanampatti, Karadikal, Thirumangalam, Madurai.	Kunnanampatti village peoples welcomes this AIIMS hospital. Important point is medical waste should be transported and disposed properly.
11	P.Thangapandi	Male	23	No.2/107, Kunnanampatti, Karadikal, Thirumangalam, Madurai.	If this hospital came to our village its very useful for peoples. Hospital should control medical waste should not disposed at village lands.
12	Paraman	Male	38	East Streer, Kannanampatti, Madurai.	We welcome this hospital.
13	Thanagvelu	Male	56	No.07 East Streer, Kannanampatti, Madurai.	We welcome this hospital.
14	Magalingam	Male	53	East Streer, Kannanampatti, Madurai.	We welcome this hospital.
15	R.Periyakaruppan	Male	62	No.8 East Streer, Kannanampatti, Madurai.	We welcome this hospital.

16	Nithishkumar	Male	21	Kunnanampatti, Karadikal, Thirumangalam, Madurai.	We welcome this hospital.
17	T.Muthuvel Murugan	Male	26	Kunnanampatti, Karadikal, Thirumangalam, Madurai.	If this hospital came to our village we will get immediate treatment. Our village will be benefited if this hospital comes.
18	Sathish	Male	19	East Streer, Kannanampatti, Madurai.	We welcome this hospital. We expect employment opportunity.
19	M.Kannan	Male	26	Kunnanampatti, Karadikal, Thirumangalam, Madurai.	In this hospital my village and surrounding village also will get benefits. Care should be taken to avoid ground water depletion and agriculture in our village should not be affected by this hospital.
20	K.Vasanth	Male	26	Kunnanampatti, Karadikal, Thirumangalam, Madurai.	In this hospital please ensure that we will get high special treatment also simply and properly.

Table 2: Public Opinion and Comments collected at Karadikal, on 21st October 2020

No.	Name of person	Gender	Age	Address	Opinion/comments
1	A.Subbulakshmi	Female	52	HSC,Karadikal, Madurai.	We have welcomes this hospital here, AIIMS hospital need to be establish because this is very important to surrounding people.
2	Perumalakkal	Female	40	Ward No.1, West Street, Karadikal, Madurai.	Growth in the medical field is expected, kindly follow the mitigation measures to avoid spoiling the existing environmental conditions.
3	M. Pechi	Female	50	Ward No.1,Pillaiyarkovil Street,, Karadikal,Ward No.1, West Street, Karadikal, Madurai.	We welcome this hospital, it's good for people.
				MADURAI.	We expect employment opportunity from this hospital
4	S.Sivapandi	Male	32	Jallikattu Street, Karadikal,Madurai.	Kindly give us employment opportunity.
5	R.Ramu(Sanitary Worker)	Male	45	West Street, Karadikal,Madurai.	People will get much benefits and medical facilities.
6	R.Baskaran	Male	52	Karadikal, Madurai	If this hospital came to her nearby villages lands get higher value than current value if hospital comes it very useful.

7	R.Murugan	Male	57	Solavanthan Road, Karadikal, Madurai.	We welcome this hospital. Kindly renovates current transportation facility.
8	S.Peramkumar	Male	23	3/120, Pillaiyarkovil Street, Karadikal, Madurai.	Treated water should be properly conveyed and disposed. Measures to be taken to maintain the ground water table.
9	Sundarapandi,Ba.Bted	Male	28	117/24, Puthuline Street, Karadikal, Madurai.	Necessary to take action in order to prevent from communicable disease.
10	Thevarajan Pandiammal	Female	40	30/1, Puthuline Street, Karadikal, Madurai.	We welcome this hospital.
11	P. Kowsalya	Female	23	West Street, Karadikal Madurai.	-
12	S. Suguna	Female	23	Kadikal, Madurai	We welcome this hospital and development of this hospital will be very useful us.
13	M.Suthan	Male	60	Karadikal, Madurai	We welcome this hospital
14	Akkammal	Female	60	No 4, 1 St Ward East Street,Kadikal, Madurai.	-
15	Karmegam	Male	55	1st Ward, Est Street, Karadikal,Madurai	-
16	Ammasi	Male	57	2 Ward Karadikal,Madurai.	We welcomes this hospital
17	C. Muthuraman	Male	56	No.59 West Street, Karadikal, Madurai.	-
18	Muthukali	Male	53	West Street, Karadikal Madurai.	We welcome this hospital
19	P. Sundaravalli	Female	36	Karadikal, Madurai	Hospital should not affect the surrounding farmers, other than We welcome this hospital.
20	Umamageshwari	Female	33	1/15, West Street, Karadikal, Madurai.	Medical waste should be properly transport and disposed
21	P. Alagammal	Female	50	West Street,Karadikal, Madurai	-

Table 3: Public Opinion and Comments collected at Urappanur, on 21st October 2020

No.	Name of Person	Gender	Age	Address	Opinion/Comments
1	P.Aasai	Male	18	1/15, North Street , Urappanur, Karadikal, Madurai	We expect area development at the same time provide employment opportunity.
2	P.Pothumani	Male	46	No.7 Pillayar Kovil Street, Urappanur, Madurai	My left foot toe had been removed due to diabetes hence if this hospital came here it's very useful for me.

3	Palpandi	Male	48	7 Th Ward North Street, Urappanur, Madurai	We welcome this hospital
4	Sundari	Female	22	8 Th Ward, North Street, Urappanur,Madurai.	We are expecting this hospital to quick. No work has been started after laying foundation stone.
5	P.Rasathi	Female	55	Urappanur,Karadikal, Madurai	-
6	P. Divya	Female	23	Middle Street, Urappanur, Madurai.	This is good project for southern district, we expect employment opportunity
7	M. Suganya	Female	24	North Street,Karadikal, Urappanur,Madurai	-
8	Elango	Male	45	North Street,Urappanur, Madurai	We welcome this hospital
9	Jayakodi	Female	48	Pillayarkovil Street, Urappanur, Madurai,	Best medical services will in southern district's of TamilNadu. Care to be taken to control spreading of communicable disease.
10	S. Sathish	Female	30	Urappanur,Karadikal, Madurai	After establishment of this hospital, we will get good medical services
11	R. Rasakanpandi	Male	47	Urappanur,Karadikal, Madurai	Hospital comes very near to village we could get immediate treatment
12	Nagavalli	Female	60	Middle Street, Urappanur, Madurai.	Hospital is very important to my village
13	Santhiya	Female	22	Middle Street, Urappanur, Madurai.	We welcome this hospital. Kindly give employment opportunity to graduate.
14	N. Ravina	Female	20	West Street, Urappanur, Karadikal, Madurai.	We can get medical facility, kindly give employment opportunity
15	Vairamani	Male	42	02, West Street, Urappanur Madurai	We welcome this hospital
16	P.Veramani	Male	58	No.1 North Street, Urappanur, Madurai	Multispecialty hospital is very near to village We welcome this hospital
17	Uma	Female	28	North Street, Urappanur, Madurai,	We welcome this hospital
18	P.Muthuselvi	Female	20	1/50 North Street Urappanur,Madurai.	We trust will get employment opportunity. Its to near us wont late anymore to treatment so We welcome this hospital.
19	M.R. Pandi	Male	52	No.7 Middle Street, Urappanur, Madurai.	AIIMS hospital is immediate need to us

Table 4: Public Opinion and Comments collected at Thenpalanji on 22nd October 2020

No.	Name of Person	Gender	Age	Address	Opinion/comments
1	Pandiyan	Male	60	North Street, Thenpalanji, Madurai.	We welcome this hospital. To provide graduated youngster to employment opportunity
2	S.Paraman	Male	54	South Street, Thenpalanji, Madurai.	Kindly request to provide employment opportunity in our village youngster
3	M.Divya	Female	26	No. 5/183 ,South Street, Thenpalanji, Madurai.	We welcome this hospital.
4	P.Malaiveranan	Male	52	No. 5/244, South Street, Thenpalanji, Madurai.	In my home have two graduates. Kindly give employment opportunity to them. We welcome this hospital.
5	Soonamuthu	Male	51	North Street, Thenpalanji, Madurai.	We welcome this hospital.
6	G.Velmurugan	Male	50	West Street, Thnpalanji, Madurai.	We welcome this hospital.
7	Bhuvaneshwari	Female	33	West Street, Thnpalanji, Madurai.	We welcome this hospital.
8	G.Swathi	Female	15	No.1 West Street, Thnpalanji, Madurai.	We welcome this hospital. Take action should properly disposed all wastes.
9	A.Ramesh	Male	29	Thenpalaji, Madurai.	Job opportunity. Good medical treatment.
10	R. Maharajan	Male	70	No. 5/70 South Street, Thenpalanji, Madurai.	We welcome this hospital. To provide graduated youngster to employment opportunity
11	Raja	Male	58	Thenpalaji, Madurai.	We welcome this hospital. Include actions plan to provide employment opportunity to graduated persons.
12	Magalingam. K	Male	70	Thenpalaji, Madurai.	We welcome this hospital. Traffic regulations shall be undertaken. We need employment opportunity
13	A.Meena	Female	35	Middle Street, Thenpalaji, Madurai.	We welcome this hospital. Make sure employment opportunity to our village peoples.
14	Aruna	Female	21	No.5/225, Middle Street, Thenpalaji, Madurai.	We welcome this hospital. Give important to our village people while giving employments.
15	P.Balasubramaniyam	Male	51	North Street, Thenpalanji, Madurai.	We welcome this hospital.

16	Janatha	Female	39	No. 180, West Street, Thnpalanji, Madurai.	We welcome this hospital.
17	Suresh	Male	28	No,5/309, South Street, Thenpalanji, Madurai.	We need new roadway to access to hospital, We welcome this hospital.
18	Ramar	Male	28	No. 5/338, North Street, Thenpalanji, Madurai.	Kindly request to provide employment opportunity in our village youngster
19	Murugeshwari.S	Female	40	No.5/203, West Street, Thnpalanji, Madurai.	Local people need employment opportunity. Make new roadway to hospital. Provide street lights.
20	Panjavarnam	Female	39	Thenpalaji, Madurai.	We welcome this hospital.
21	Velusamy	Male	60	No. 5/107, North Street, Thenpalanji, Madurai.	We welcome this hospital.
22	Murugeshwari	Female	27	No. 5/200, West Street, Thnpalanji, Madurai.	We welcome this hospital.

Table 5: Public Opinion and Comments collected at Vedarpullankulam on 22nd October 2020

No.	Name of Person	Gender	Age	Address	Public opinion/comments
1	P.Kovindhan	Male	65	South Street, Vedarpullankulam,Madurai.	We welcome this hospital. We have hereditary framing so our agriculture should not be affected. Otherwise there is no objection to this hospital.
2	R.Kesavakumar	Male	30	No7/125, Vedarpullankulam, Madurai.	Employment assistances for our villagers. We need to conserve ground water. We need to conserve natural resources. Clean the waste water before discharge. Start the work immediately without further delay.
3	N.Sasikumar	Male	34	No.2/465, North Street, Vedarpullankulam, Madurai.	Employment assistances for our village youngster. We need to conserve ground water. We need to conserve natural resources. Clean up waste water. Start the work very soon.
4	Muthu	Male	65	No.90 Middle Street, Vedarpullankulam,Madurai.	I have diabetes. In this situation I welcomes this hospital.
5	N. Pitchamani	Male	45	No.2/81, Muniyandi Illam, Center Street, Vedarpullamkulam, Madurai.	We heart fully welcome the government scheme to village area. Thank you
6	V.Muniyandi	Male	60	Vedarpulankulam, Madurai.	We welcome this hospital. Need employment opportunity to graduates.

7	R.Sunbu	Male	54	East Street, Vedarpulankulam, Madurai.	We welcome this hospital. Need employment opportunity to graduates. If this hospital come to our village its very useful.
8	Duraikalai	Male	63	No. 2/40, Middle Street, Vedarpulankulam, Madurai,	We welcome this hospital.
9	S.Balasundar	Male	31	No.2/34, Middle Street, Vedarpulankulam, Madurai	The surrounding rural youngsters and general public should be given employment priority according to their qualifications thereby enhancing their livelihood and economic status. Thanks.
10	Uma Rani	Male	46	No. 96 Vedarpulankulam.Madurai.	-
11	Nivetha	Female	20	No.1/125, Middle Street, Vedarpulankulam. Madurai.	We welcome this hospital
12	Pullammal	Female	44	No/44 Middle Street, Vedarpulankulam, Madurai.	Increase employment opportunity.
13	M. Murugan	Male	65	No.469, Middle Street, Vedarpulankulam, Madurai,	We welcome this hospital
14	D.Nalasamy	Male	28	V.P Sithan Nagar, Vedarpulankulam, Madurai.	It is better to set up a hospital whereas in the surrounding villages the waste should be treated in a manner, such that it does not create any harmful to agriculture, nature and the villagers. Our village people should be given priority in employment.
15	P.Manikandan	Male	20	No. 2/272, Middle Street, Vedarpulankulam, Madurai.	Educated youth in my village are out of work so propriety should be given for them.
16	M.Ramesh	Male	25	No.1/52, Pasumpon Street, Vedarpulankulam, Madurai.	Educated youth in our town are unemployed priority should be given to them. Groundwater should be protected. The surrounding villages should be protected for agriculture.
17	Nagalakshmi	Female	50	Middle Street, Vedarpulankulam, Madurai.	We welcome this hospital.
18	T. Pandi	Male	23	Middle Street, Vedarpulankulam, Madurai.	Assure employment opportunity.
19	S. Periyasamy	Male	62	Middle Street, Vedarpulankulam, Madurai.	We welcome this hospital.

20	Pandi	Male	60	East Street, Vedarpulankulam, Madurai.	Assure employment opportunity to youngsters.
21	Alagarsamy	Male	21	No.12/241, Middle Street, Vedarpulankulam, Madurai.	We welcome this hospital.
22	Gopika	Female	20	Middle Street, Vedarpulankulam, Madurai.	We welcome this hospital.
23	Palpandi	Male	45	Middle Street, Vedarpulankulam, Madurai.	We welcome this hospital. The hospital is good.
24	Prabu	Male	41	Middle Street, Vedarpulankulam, Madurai.	We looking forward to this hospital.
25	Muniammal	Female	62	No.1/91, Middle Street, Vedarpulankulam, Madurai.	We looking forward to this hospital.
26	Rasathi	Female	39	Middle Street, Vedarpulankulam, Madurai.	Pollution control must be followed properly.

Table 6: Public Opinion and Comments collected at Thanakkankulam on 23rd October 2020

No.	Name of person	Gender	Age	Address	Opinion/Comments
1	A.Thevanthiran	Male	50	No.2/6, Nethaji Street, Thanakkankulam, Madurai.	Hospital solid and liquid waste should be properly transport and disposed, take necessary control measures for communicable disease. Kindly give employment opportunity for graduates peoples.
2	P. Anandhipandi mohan	Female	45	No.2/6, Nethaji Street, Thanakkankulam, Madurai.	Chances to water scarcity to village surrounding hospital agriculture people, therefore hospital shall take necessary actions. Water scarcity to surrounding peoples should be avoided.
3	K.Chinnapandian	Male	30	No.2/262 Perumal Kovil Street, Thanakkankulam Madurai.	Increase in pollutant of air environment due to emission from the project activity. This has to be controlled.
4	M. Kannan	Male	44	No.1/384 Kirshna Nagar, Thanakkankulam, Madurai.	Youngsters will get employment opportunity. Southern districts peoples will get medical facility. Nearby airport will have the chances of upgrading to international airport also. Hence, I welcomes the project.

5	E.Venkatesh	Male	23	No 2/300 Perumalkovil Street, Thanakkankulam, Madurai.	This hospital will help senior person peoples (above 60 years) to get immediate treatment.
6	Rajenthiran	Male	59	Thanakkankulam, Madurai.	Graduate peoples in our village should be provided with employment opportunity. People can get properly treatments.
7	A. Arumugam	Male	48	Thanakkankulam, Madurai.	-
8	Raja	Male	40	Thanakkankulam, Madurai.	We welcome this hospital,
9	Mani	Male	23	Thanakkankulam, Madurai.	Hospital should take necessary action to prevention ground water depletion. We welcome this hospital.
10	A. Thangamani	Male	60	No 2/302, Thanakkankulam, Madurai.	We welcome this hospital,
11	R. Arunprasanth	male	25	No.3/69 Thanakkankulam, Madurai.	Hospital should take actions to prevent air pollution.
12	Rajangam	Male	75	Thanakkankulam, Madurai.	If aims hospital came here it's very useful and good for poor people.
13	K.Murugan	Male	34	No.2/70, Nethaji Street, Thanakkankulam, Madurai.	People get highly benefits and they should be provided with employment.
14	Thirupathi	Male	43	Thanakkankulam, Madurai.	We welcome this hospital and to should make sure surrounding village people will get employment opportunity.
15	R.Kannadisamy	Male	51	No 2/8 Kalani Street, Thanakkankulam, Madurai,	Special treatment (to treat COVID) shall be included in the proposed hospital, graduate people should be provided with employment.
16	Pothuraja	Male	38	No.3/36, Pasumpon Street, Thanakkankulam, Madurai.	We welcome this hospital.
17	Annalakshmi	Female	35	Thanakkankulam, Madurai.	Very good project. Must arrange employment opportunity to people and should prevent pollution from the project.
18	Thalvaie	Female	60	Thanakkankulam, Madurai.	We welcome this hospital.
19	S. Susila	Female	52	No.2/32, Thanakkankulam, Madurai.	Good for this hospital kindly give employment opportunity to graduates.
20	M.Manikannadan	Male	38	No.1/22a Ayyanar Street, Thanakkankulam, Madurai,	We have welcomes this hospital
21	Aijthkumar	Male	23	No 2/6 Nethaji Street, Thanakkankulam, Madurai.	We welcome this hospital
22	Thevaraj .M	Male	48	No .71/58, Nethaji Street, Thanakkankulam, Madurai.	We welcome this hospital. Kindly make awareness about this hospital to peoples.

23	Ajaye	Male	17	Thanakkankulam, Madurai.	Medical waste should be properly transported and disposed. Precautions to be made to avoid spread of communicable disease. Quick treatment should be provided.
24	Santhi	Femal	38	No .1/50, Nethaji Street, Thanakkankulam, Madurai	We welcome this hospital
25	Karthikadevi	Female	22	No.74/69, Nethaji Street, Thanakkankulam, Madurai.	-
26	Kammachiammal	Female	43	Thanakkankulam, Madurai.	Very useful for people. Recruit good and hygienic staff for this hospital.
27	Aijitha	Female	22	No 1/58, Nmethaji Street, Thanakkankulam,L Madurai.	We welcome this hospital
28	Rajkumar	Male	27	No.2/6, Nethaji Street, Thanakkankulam, Madurai.	We welcome this hospital
29	Sugasini	Female	-	Thanakkankulam, Madurai.	We need employment opportunity. We welcome this hospital.
30	N. Sarashwathi	Female	52	No. 4/83, Krishan Nagar, Thanakkankulam, Madurai,	We welcome this hospital. Hospital should prevent pollution in the surrounding environment.

Table 7: Public Opinion and Comments collected at Uchapatti on 23rd October 2020

No.	Name of Person	Gender	Age	Address	Opinion/comments
1	B. Pechayammal	Male	63	East Street, Uchapatti, Madurai.	We welcome this hospital heart fully. I request you that solid waste and liquid waste should be transported and disposed properly. Educated people's needs employment opportunity. Please make sure that livelihood should not be affected in any way after establishment of hospital.
2	A.Vijaya Ram Bharthan	Male	31	No. 1/44, North Street, Uchapatti, Madurai,	I ask the hospital to encourage nursing - educated students in our town. Give us hygienic and clean environment to peoples.
3	V.Rangarajan	Male	33	No.1/69, North Street, Uchapatti, Madurai.	We welcome this hospital. In the way of raising the livelihood of the waves that providing a job according to the graduation.
4	Poomirajan	Male	57	West Street, Uchapatti,Madurai.	This hospital is benefit to us.
5	Jagan	Male	29	Uchapatti, Madurai.	There is a risk that agricultural land will be affected and the surrounding agricultural land will be affected. Outside wastes have been dumping in my land.

6	A.Pandiselvi	Female	21	Uchapatti, Madurai.	We need job offer.
7	Pandiammal	Female	50	North Street, Uchapatti, Madurai.	Create employment opportunities.
8	Muthammal	Female	65	North Street, Uchapatti, Madurai.	-
9	Alagarsamy	Female	67	Mela Theru, Uchapatti, Madurai.	We welcome this hospital. Agricultural lands should not be affected.
10	Rajenthiran	Male	70	Mela Theru, Uchapatti, Madurai.	I have been mentally depression for twenty-five years. My agricultural land has been taken by government for establishment of AIIMS. But the compensation provided is not as per market value. Kindly increase the value and ask government to provide the fund immediately.
11	M.Jayaraj	Male	70	Mela Theru, Uchapatti, Madurai.	I welcome this hospital.
12	Alagumani	Male	40	North Street, Uchapatti, Madurai.	Create a employment opportunity to youngsters in our town.
13	Avadaiammal	Female	60	West Street, Uchapatti,Madurai.	-
14	V.Sulachana	Female	40	No.1/87, North Street, Uchapatti, Madurai.	We welcome this hospital.
15	B.Subbulakshmi	Female	46	No. 1/2 North Street, Uchapatti, Madurai.	-
16	Rajeshwari	Female	60	No. 1/70, West Street, Uchapatti, Madurai,	-
17	Pasupathi	Male	50	Middle Street, Uchapatti, Madurai.	-
18	K.Rmar	Male	43	No.1/28, West Street, Uchapatti, Madurai.	-
19	Jakkammal	Female	43	Uchapatti, Madurai.	-
20	Vellaiammal	Female	65	Middle Street, Uchapatti, Madurai.	-
21	Alagammal	Female	50	North Street, Uchapatti, Madurai.	We welcome this hospital.
22	R.Pechaiammal	Male	65	West Street, Uchapatti,Madurai.	Educated youngster need employment opportunity.
23	Pandi	Male	55	West Street, Uchapatti,Madurai.	-
24	S.Nagammal	Female	53	Mela Theru, Uchapatti, Madurai.	We welcome this hospital.
25	Sivalingam	Male	39	West Street, Uchapatti,Madurai.	We welcome this hospital.
26	Anbukuberan	Male	38	No.1/70, West Street , Uchapatti, Mudurai.	Action must be taken to reduce land grabbing.

Table 8: Public Opinion and Comments collected at Chettikulam on 24th October 2020

No.	Name of Person	Gender	Age	Address	Opinion/comments
1	Muthumayan.R	Male	40	Chettikulam, Madurai.	Educated persons need permanent jobs. The hospital is very important. Government should take care of water scarcity.
2	Alagar	Male	39	No.1/110, Indhira Colony, Chettikulam, Madurai.	Pollution control must be followed properly. Farmland should be protective. Otherwise we welcome this hospital.
3	Kaluvai	Male	40	South Street, Chettikulam, Madurai,	It would be good my son Mayandi (B.Com.CA) would gets good job in this hospital. Waste water should be disposed properly.
4	Valamathi	Female	39	Chettikulam, Madurai.	I urge you to differentiate between keeping our villages clean as work and improving diet.
5	Pandiammal	Female	45	South Street, Chettikulam, Madurai,	We welcome this hospital. We request you facilitate roadway to hospital. Kindly create good job opportunity.
6	S. Avadathai	Female	49	Manthai Street, Chettikulam, Madurai.	AIIMS hospital should have good methodology to treat medical waste without contaminating agricultural lands. Educated youth in our village should be given jobs. Our town has no facility in primary school.
7	Sundarammal	Female	75	North Street, Chettikulam, Madurai.	The existing environmental condition should be preserved. We welcome the arrival of the government hospital.
8	T. Selvapathi	Female	58	Chettikulam, Madurai.	We welcome this hospital. People in our village should be given jobs. Waste should be disposed properly.
9	O.Pasupathi	Male	75	Chettikulam, Madurai.	AIIMS is so good if coming here.
10	S.Sekar	Male	45	East Street, Chettikulam, Maudrai.	I would like to job offer through AIIMS Hospital.
11	A Suganiya	Female	24	East Street, Chettikulam, Maudrai.	We welcome this hospital. Give job offers for people.
12	R.Sangiliperumal	Male	26	East Street, Chettikulam, Maudrai.	We welcome this hospital. Give us employment opportunity.
13	S.Alagarsamy	Male	26	East Street, Chettikulam, Maudrai.	I want to have job offer from the hospital.
14	Kamaladevi	Female	23	South Street, Chettikulam, Madurai,	This hospital will have benefits to us.
15	Sumathi.A	Female	29	East Street, Chettikulam, Maudrai.	I welcome this hospital. Give job offer according to my studies.
16	Kurusamy	Male	30	East Street, Chettikulam, Maudrai.	We welcome this hospital.
17	R.Kamatchi	Female	24	East Street, Chettikulam, Maudrai.	Through the AIIMS hospital people should get benefits.
18	R.Sangili	Male	29	East Street, Chettikulam, Maudrai.	AIIMS should create employment for the villages around the hospital.

19	Saraniya	Female	19	East Street, Chettikulam, Maudrai.	Assure employment opportunity.
20	P.Sandhiya	Female	22	East Street, Chettikulam, Maudrai.	We welcome this hospital. Need job for educated peoples.
21	S.Ramar	Male	35	East Street, Chettikulam, Maudrai.	Through the hospital I should get job.
22	Pandiammal.T	Female	40	West Street Chettikulam, Madurai	We welcome this hospital. There are some people who are addicted to drugs and I ask you to help them recover.
23	S.Muthukumar	Male	20	East Street, Chettikulam,Maudrai.	Through the hospital everyone should get benefited.
24	Alagupillai	Male	45	East Street, Chettikulam,Maudrai.	Educated youth should get jobs.
25	Meena	Female	27	Pallikuda Street, Chettikulam, Madurai.	The hospital will be very benefits to children.
26	Paunthai	Female	48	Pallikuda Street, Chettikulam, Madurai.	Thanks for the consultation with us before the establishment.
27	Sundharam	Male	36	East Street, Chettikulam,Maudrai.	We welcome this hospital.
28	Mariammal	Female	21	No.7 East Street, Chettikulam, Madurai.	-

Table 9: Public Opinion and Comments collected at Sakkilipatti on 24th October 2020

No.	Name of person	Gender	Age	Address	Opinion/Comments
1	K.Aginiveran	Male	50	South Street, Sakkilipatti, Madurai.	We welcome this hospital
2	Meena	Female	35	Sakkilipatti, Madurai.	Nearby village will get medical facility. Graduate youngster need employment opportunity.
3	M.Murugan	Male	51	North Street, Sakkilipatti, Madurai.	We welcome this hospital
4	P. Rajeshkumar	Male	31	East Street, Sakkilipatti, Madurai.	We welcome this hospital. Graduates need employment opportunity.
5	P. Muthaiya	Male	40	East Street, Sakkilipatti, Madurai.	Ensure our village will be benefited and to have best treatments.
6	Sevannammal	Female	65	East Street, Sakkilipatti, Madurai.	Hospital comes to near to us. so give us quick treatment facility.
7	Murthi	Male	60	West Street,Sakkilipatti, Madurai.	We welcome this hospital
8	Sithra	Female	40	South Street, Sakkilipatti, Madurai.	Our village have graduate youngster who needs employment opportunity.
9	V.Sekar	Male	51	No.1/8 East Street, Sakkilipatti,Madurai.	We welcome this hospital. Graduates needs employment opportunity. We need best treatment in low budget.
10	Sundaravalli	Female	41	Sakkilipatti, Madurai.	We welcome this hospital. Kindly we need roadway to access to hospital from our village north side.
11	V.Hariharan	Male	18	Aasaree Street, Sakkilipatti, Madurai.	-
12	Killadimayan	Male	70	East Street, Sakkilipatti, Madurai.	We welcome this hospital.

13	Kathick.P	Male	23	No.22/1, East Street, Sakkilipatti, Madurai.	I need employment opportunity through AIIMS hospital
14	V.Pandi	Male	46	East Street, Sakkilipatti, Madurai.	Hospital access way need to have very short distances. Hospital entrances should have another entrance in the Northern side.
15	W.Abinaya	Female	21	East Street, Sakkilipatti, Madurai.	It's very beneficial to peoples, hospital implementation to here. Lot of people will get employment opportunity.
16	P.Meena	Female	35	No.36/1 , East Street, Sakkilipatti, Madurai.	If here has hospital we can save to many humans life. It will help lots of villages. We welcome this hospital.
17	Jegan	Male	34	East Street, Sakkilipatti, Madurai.	Surrounding agriculture have water scarcity. Environmental affected.
18	Gopi	Male	30	No.1/88 ,East Street, Sakkilipatti, Madurai.	We welcome this hospital. Improve road transportation to hospital access. Waste water should be disposed properly.
19	Vijaypermalatha	Female	23	No. 38, East Street, Sakkilipatti, Madurai.	We welcome this hospital.
20	Raman	Male	50	Melath Theru, Sakkilipatti, Madurai.	We welcome this hospital.
21	Kasi.P	Male	25	Melath Theru, Sakkilipatti, Madurai.	We welcome this hospital.
22	Rajeshkumar.P	Male	31	No. 1/31, East Street, Sakkilipatti, Madurai.	Local people need employment opportunity. Increase employment opportunity to graduated peoples. Improve transportation facility.
23	M.Balamurugan	Male	54	No.1/14 , East Street, Sakkilipatti, Madurai.	We welcome this hospital.
24	Selvi	Male	35	No.1/5, East Street, Sakkilipatti, Madurai.	We welcome this hospital.
25	Mariammal	Female	48	South Street, Sakkilipatti, Madurai.	We welcome this hospital. Improve road transportation to hospital access.
26	Sreekanth	Male	32	No. 21/7, East Street, Sakkilipatti, Madurai.	We welcome this hospital. It's very benefits to surrounding villages.
27	M.Pandi	Male	50	East Street, Sakkilipatti, Madurai.	We welcome this hospital.

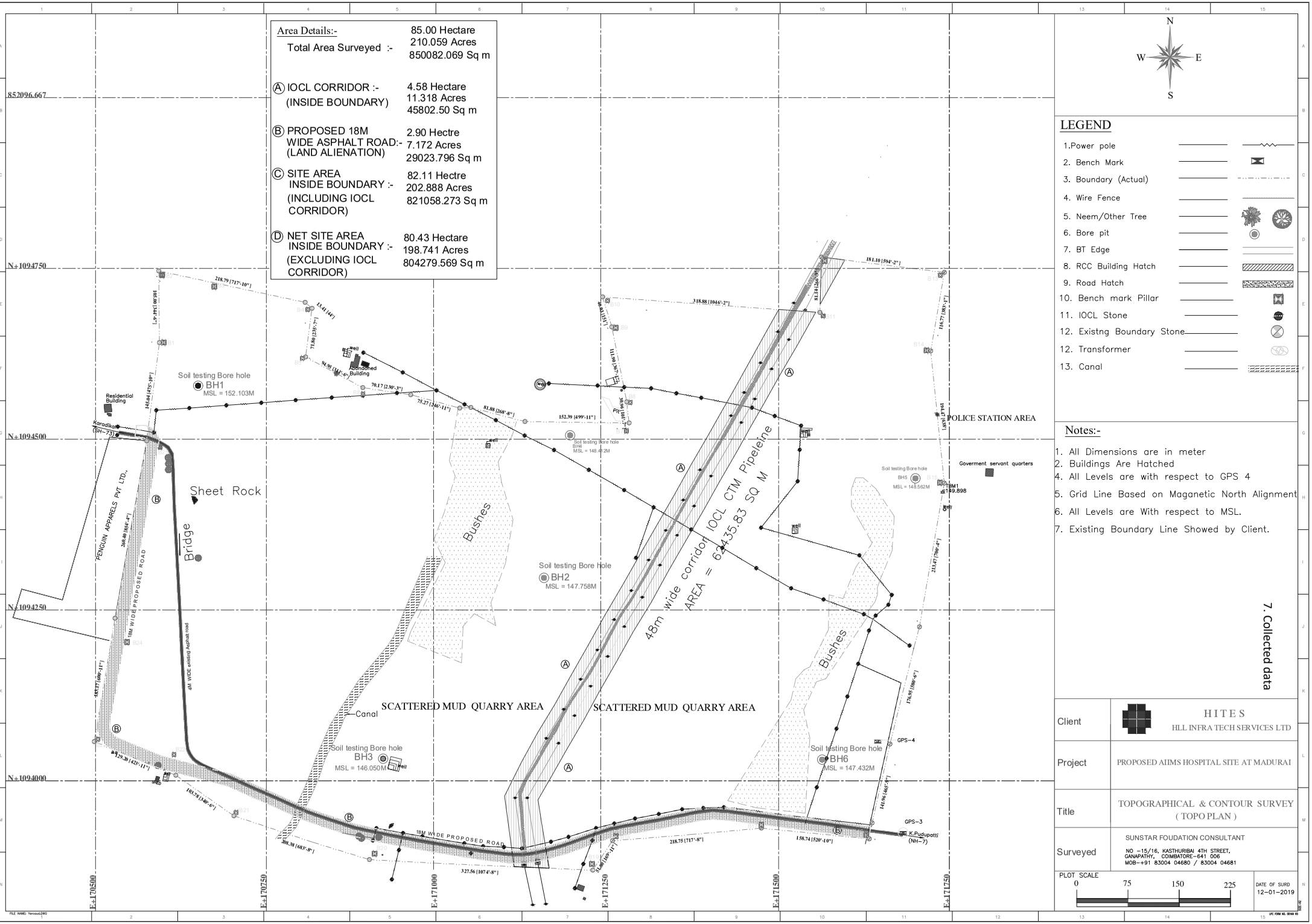
Table 10: Public Opinion and Comments collected at Thoppur on 26th October 2020

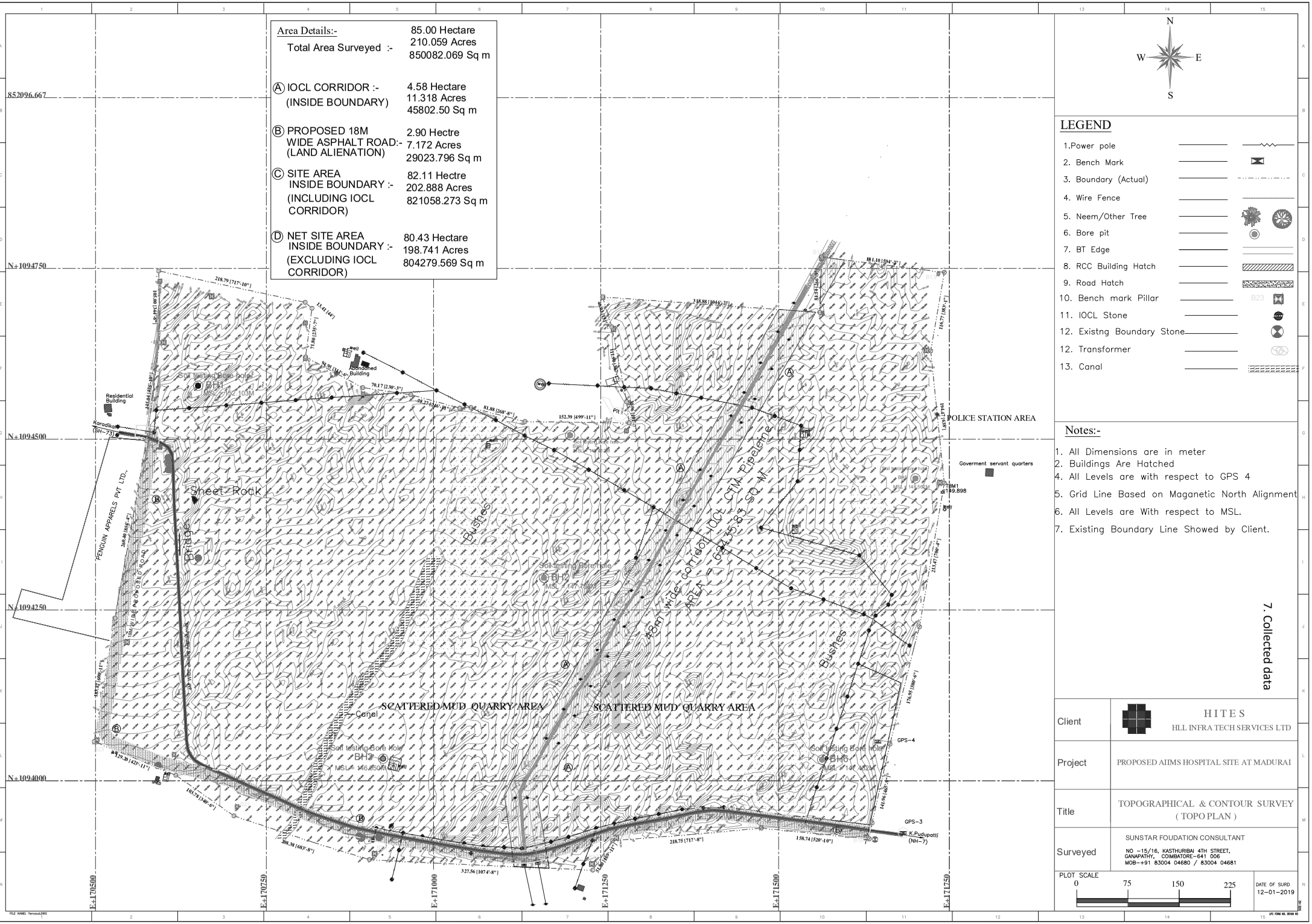
No.	Name of Person	Gender	Age	Address	Opinion/comments

1	S.Nalakannu	Male	71	Ammankovil Street,Thoppur, Madurai.	We welcome this hospital here and need employment opportunity to our village youngster.
2	V. Malathi	Female	47	Thoppur, Thiruparamkunram, Madurai.	We welcome this hospital here and need employment opportunity to our village peoples. Water scarcity should not happen due to this hospital establishment.
3	V.Meena	Female	26	Ammankovil Street,Thoppur, Madurai.	We welcome this hospital. Need employment opportunity to graduates in our village. After establishment of hospital care should be taken not to avoid livelihood.
4	Satheshkmar	Male	34	No.2/202, Thabavanam, Thoppur, Madurai.	We have benefits if this hospital comes here.
5	Murugan	Male	57	Thoppur, Thiruparamkunram, Madurai.	We welcome this hospital. We can get special treatments also.
6	M.Nagarajan	Male	29	Thoppur, Thiruparamkunram, Madurai.	This hospital is very benefits to us. Rising commodity prices have affected our agricultural lands. The government should give us another place if the environmental affected.
7	Seeladevi	Male	33	No.59 Ammankovil Street , Thoppur, Madurai.	I request you to offer job according to course studied.
8	Kathirvel	Male	50	Pillaiyarkovil Street, Thoppur, Madurai.	We welcome this hospital. I request you to facilitate new roadway to hospital.
9	Pandiammal	Male	64	Ammankovil Street,Thoppur, Madurai.	We welcome this hospital.
10	Inthira	Female	45	Pillaiyarkovil Street, Thoppur, Madurai.	We welcome this hospital
11	M.Irulayee	Female	55	Ammankovil Street,Thoppur, Madurai.	We welcome this hospital. It's very useful.
12	Brindha	Female	26	Manthai Street, Thoppur, Madurai.	It is good to come this hospital. We can get treatment soon.
13	Pechi	Female	38	3rd Street, Thoppur, Madurai.	We welcome this hospital. We can get very benefits. Need employment opportunity.
14	Santhanam	Female	75	Perumal Kovil Street,Thoppur, Madurai.	People will get benefits from AIIMS hospital.
15	Dhanalakshmi	Female	50	Perumal Kovil Street,Thoppur, Madurai.	We welcome this hospital. It's very useful.
16	K.Vellaiyan	Male	70	Main Road, Thoppur, Madurai,	We welcome this hospital.
17	N.Paramasivan	Male	58	No.2/202, Thabavanam, Thoppur, Madurai.	I have kidney failure. It very good to come here this hospital at this time.
18	Muthu	Female	22	Pillaiyarkovil Street, Thoppur, Madurai.	We welcome this hospital.

19	Visayam	Female	49	Pillaiyarkovil Street, Thoppur, Madurai.	Already due to some development in Madurai corporation area, our agricultural land and grazing land for our cattle's got reduced. After this development our livestock grazing.
20	Sundarrajan.R	Male	58	No. 1/16, Vinayagar Kovil Street, Thoppur, Madurai.	We welcome the AIIMS hospital.
21	G.Sokkar	Male	55	No.3/123, Perumalkovil Street, Thoppur, Madurai,	We welcome this hospital.
22	B.Sumathi	Male	35	No.1/27, Manthai Street, Thoppur, Madurai.	There is no hospital in my village, so We welcome this hospital.
23	K.Nagaraj	Male	50	No.1/21, Amman Kovil Street, Thoppur,Madurai.	We welcome this hospital.
24	Sundare	Female	43	Ammankovil Street,Thoppur, Madurai.	We welcome this hospital. Poor people can also get special treatment. We can get low budget treatment.
25	Brema.S	Female	21	Ammankovil Street,Thoppur, Madurai.	I assure you that there is no objection in any way to coming this hospital.
26	M.Chinnakali	Female	58	Ammankovil Street,Thoppur, Madurai.	I assure you that there is no objection in any way to coming this hospital.
27	Rajasekar.R	Male	33	No,3/25, Pillaiyarkovil Street, Thoppur, Madurai.	We welcome this hospital. Need employment opportunity to graduate youngsters. There is no objection and we expect commodity price will rising also.
28	S.Devi	Female	25	No. 3/9, Pillaiyarkovil Street, Thoppur, Madurai.	We welcome this hospital.
29	Banupriya	Female	30	No. 2/137, Main Road, Thoppur,Madurai,	I request you to take appropriate action to remove the medical waste. Need employment opportunity.
30	Sundaravalli	Female	38	East Street, Thoppur, Madurai.	We welcome this hospital.
31	Ammavasai	Male	62	Ammankovil Street,Thoppur, Madurai.	We welcome this hospital.
32	Pushpa	Female	45	No.2/66, Ammankovil Street, Thoppur Madurai.	We welcome this hospital.
33	D.Senbagavalli	Female	20	No.5/125, Main Street, Thoppur, Madurai.	The water scarcity has started in our village 2 months in every year. I request you to kindly make action plan that water scarcity should not increase.

ANNEX 7. Collected Data


Area Details:-
Total Area Surveyed :- 85.00 Hectare 210.059 Acres 850082.069 Sq m
Ⓐ IOCL CORRIDOR :- (INSIDE BOUNDARY) 4.58 Hectare 11.318 Acres 45802.50 Sq m
Ⓑ PROPOSED 18M WIDE ASPHALT ROAD:- (LAND ALIENATION) 2.90 Hectre 7.172 Acres 29023.796 Sq m
Ⓒ SITE AREA INSIDE BOUNDARY :- (INCLUDING IOCL CORRIDOR) 82.11 Hectre 202.888 Acres 821058.273 Sq m
Ⓓ NET SITE AREA INSIDE BOUNDARY :- (EXCLUDING IOCL CORRIDOR) 80.43 Hectare 198.741 Acres 804279.569 Sq m
852096.667
N+1094750
N+1094500
N+1094250
N+1094000
E+170500
E+170750
E+171000
E+171250
E+171500
E+171750
Soil testing Bore hole BH1 MSL = 152.103M
Soil testing Bore hole BH2 MSL = 147.758M
Soil testing Bore hole BH3 MSL = 146.050M
Soil testing Bore hole BH4 MSL = 148.412M
Soil testing Bore hole BH5 MSL = 148.562M
Soil testing Bore hole BH6 MSL = 147.432M
Residential Building
Abandoned Building
Well
Karadikal (SH-73)
Sheet Rock
Bridge
PENGUIN APPARELS PVT LTD.,
18M WIDE PROPOSED ROAD
4M WIDE existing Asphalt road
Bushes
48m wide corridor IOCL CTM Pipeline AREA = 64435.83 SQ M
SCATTERED MUD QUARRY AREA
SCATTERED MUD QUARRY AREA
Canal
POLICE STATION AREA
Goverment servant quarters
TBM1 149.898
GPS-4
GPS-3
K.Pudupatti (NH-7)
LEGEND
1.Power pole
2. Bench Mark
3. Boundary (Actual)
4. Wire Fence
5. Neem/Other Tree
6. Bore pit
7. BT Edge
8. RCC Building Hatch
9. Road Hatch
10. Bench mark Pillar
11. IOCL Stone
12. Existng Boundary Stone
12. Transformer
13. Canal
Notes:-
1. All Dimensions are in meter
2. Buildings Are Hatched
4. All Levels are with respect to GPS 4
5. Grid Line Based on Maganetic North Alignment
6. All Levels are With respect to MSL.
7. Existing Boundary Line Showed by Client.
7. Collected data
Client HITES HLL INFRA TECH SERVICES LTD
Project PROPOSED AIIMS HOSPITAL SITE AT MADURAI
Title TOPOGRAPHICAL & CONTOUR SURVEY (TOPO PLAN)
Surveyed SUNSTAR FOUDATION CONSULTANT NO -15/16, KASTHURIBAI 4TH STREET, GANAPATHY, COIMBATORE-641 006 MOB-+91 83004 04680 / 83004 04681
PLOT SCALE 0 75 150 225
DATE OF SURD 12-01-2019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Ⓓ NET SITE AREA INSIDE BOUNDARY :- (EXCLUDING IOCL CORRIDOR) 80.43 Hectare 198.741 Acres 804279.569 Sq m
N
W
E
S
LEGEND
1.Power pole
2. Bench Mark
3. Boundary (Actual)
4. Wire Fence
5. Neem/Other Tree
6. Bore pit
7. BT Edge
8. RCC Building Hatch
9. Road Hatch
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11. IOCL Stone
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852096.667
N+1094750
N+1094500
N+1094250
N+1094000
E+170500
E+170750
E+171000
E+171250
E+171500
E+171750
POLICE STATION AREA
Goverment servant quarters
Residential Building
Abandoned Building
Well
Soil testing Bore hole BH1 MSL : 152.103M
Soil testing Bore hole BH2 MSL : 147.560M
Soil testing Bore hole BH3 MSL : 146.650M
Soil testing Bore hole BH4 MSL : 144.560M
TBM1 149.898
Karadikal (SH-73)
PENGUIN APPARELS PVT LTD.,
Sheet Rock
Bridge
Bushes
45m wide corridor-IOCL CTM Pipeline AREA = 6241.35.83 SQ.MT
SCATTERED MUD QUARRY AREA
SCATTERED MUD QUARRY AREA
Canal
GPS-4
GPS-3
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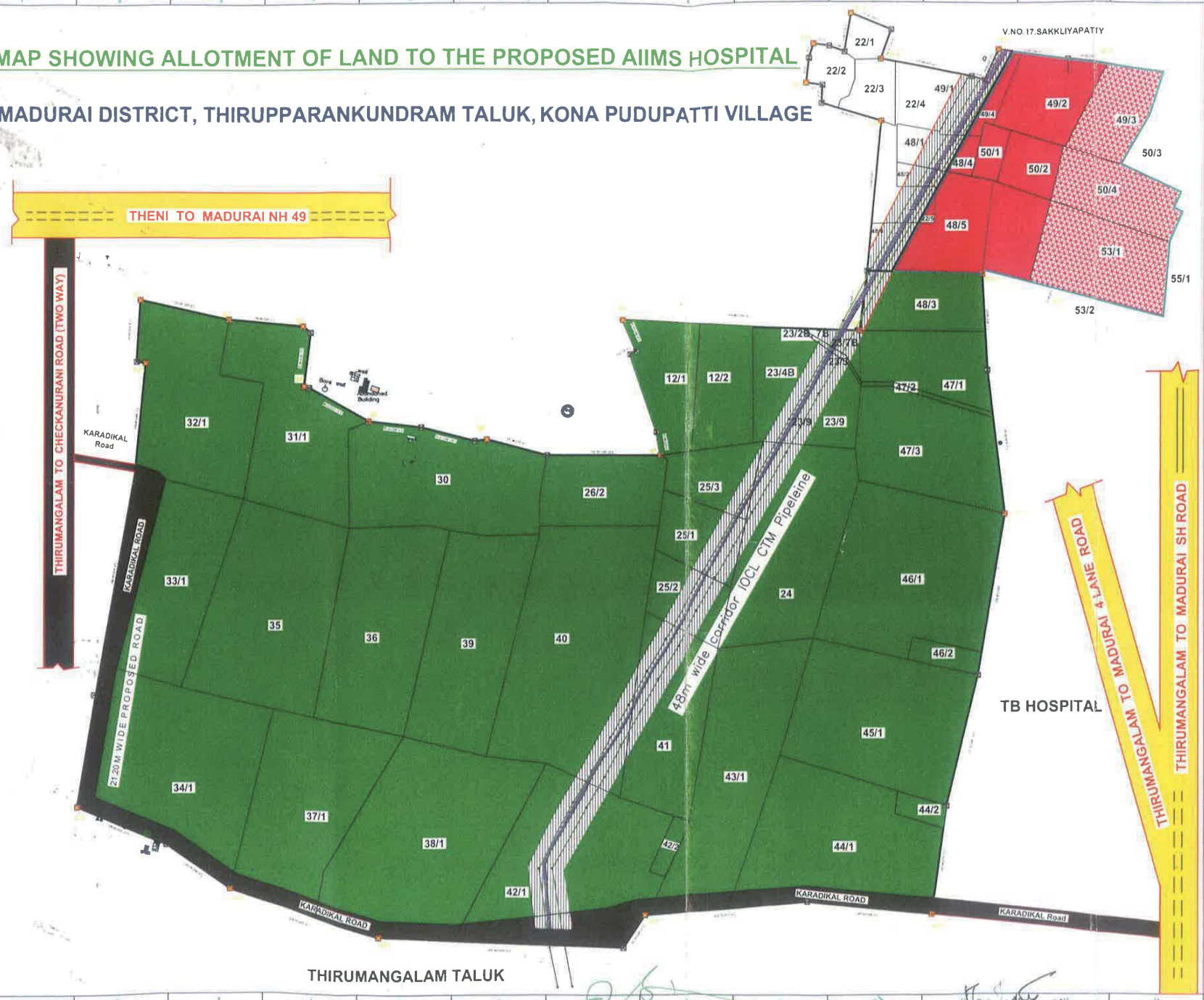
NO -15/16, KASTHURIBAI 4TH STREET, GANAPATHY, COIMBATORE-641 006
MOB-+91 83004 04680 / 83004 04681
PLOT SCALE 0 75 150 225
DATE OF SURD 12-01-2019

MAP SHOWING ALLOTMENT OF LAND TO THE PROPOSED AIIMS HOSPITAL

MADURAI DISTRICT, THIRUPPARANKUNDRAM TALUK, KONA PUDUPATTI VILLAGE



LAND ALREADY ALLOTTED (SURVEY NUMBERS)		DELETED (SURVEY NUMBERS) AS PER REQUEST	
12/1	1.43.00	22/1	0.26.50
12/2	1.17.00	22/2	0.34.00
23/2B	0.01.00	22/3	0.63.50
23/3	0.10.50	22/4(P)	1.40.50
23/4B	0.65.00	48/1(P)	0.42.00
23/5	0.71.00	48/2(P)	0.40.00
23/6B	0.31.00	49/1(P)	0.46.00
23/7B	0.04.00		3.92.50
23/8	0.20.50		(9.69 Acres)
23/9	0.35.50		
24	3.39.00		
25/1	0.92.50		
25/2	0.90.00		
25/3	0.90.00		
26/2	1.62.00		
30	3.47.50		
31/1	3.09.00		
32/1	3.26.00		
33/1	2.53.50		
34/1	4.01.10		
35	4.20.00		
36	3.46.50		
37/1	3.33.10		
38/1	4.33.00		
39	3.12.50		
40	5.81.50		
41	2.47.00		
42/1	3.63.00		
42/2	0.18.00		
43/1	3.54.20		
44/1	3.35.00		
44/2	0.20.00		
45/1	3.88.50		
45/2	0.02.50		
46/1	4.54.00		
46/2	0.28.50		
47/1	1.39.50		
47/2	0.12.00		
47/3	1.95.50		
48/3	2.03.00		
	80.96.40		
	(199.98 Acres)		

NEWLY ADDED AREA IN LIEU OF LEFT OUT AREA

49/3	1.06.00
50/3	1.19.62
53/1	1.66.88
	3.92.50
	(9.69 Acres)

ADDITIONAL LAND TO BE RE ALLOTTED (SURVEY NUMBERS)

22/5	0.10.50
48/4	0.27.00
48/5	1.38.00
49/4	0.41.50
49/2	1.33.50
49/3	1.06.00
50/1	0.20.50
50/2	0.46.00
50/4	1.19.62
53/1	2.68.00
	9.10.62
	(22.49 Acres)

LEGEND

- LAND FOR WHICH ENTER UPON PERMISSION GIVEN FOR AIIMS INSTITUTE : 199.98 Acres
- LAND FOR WHICH ADDITIONAL LAND TRANSFER PROPOSAL TO BE SENT : 22.49 Acres
- PROPOSED FOURWAY ROAD WITH SEPARATE SUBDIVISION OF LAND : 9.44 Acres
- IOCL PIPELINE LAND AREA WITH SAFETY ZONE EARMARKED : 14.8 Acres
- NATIONAL HIGHWAY (FOUR WAY)
- LANDS WHICH WERE INCLUDED IN THE EARLIER L.T. PROPOSAL AND SINCE LEFT OUT AS PER REQUEST OF MINISTRY OF H&FW G.O.I
- NEWLY ADDED AREA IN LIEU OF LEFT OUT AREA

TAHSILDAR
Thirupparankundram

7. Collected data

CWSS TO 3 MUNICIPALITIES, 6 TOWN PANCHAYATS AND 1430 RURAL HABITATIONS IN MADURAI DISTRICT & SINGAMPUNARI TOWN PANCHAYAT IN SIVAGANGAI DISTRICT.

GENERAL FLOW DIAGRAM

DPR COST Rs 780.50 Crores