Environment and Social Impact Assessment (ESIA)

Summary Report

Tamil Nadu Road Sector Project – II

(Roads Under Additional Financing)

Highways Department
(Government of Tamil Nadu)

January 29, 2020

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List of Abbreviation

CPCB	:	Central Pollution Control Board
CoI	:	Corridor of Impact
DEA	:	Department of Economic Affairs
EAC	:	Expert Appraisal Committee
EIA	:	Environmental Impact Assessment
ESIA	:	Environmental and Social Impact Assessment
ESMP	:	Environmental and Social Management Plan
EMF	:	Environmental management Framework
EMP	:	Environmental management Plan
FSI	:	Forest Survey of India
FGD	:	Focus Group Discussion
DPR	:	Detailed Project Report
GoTN	:	Government of Tamil Nadu
GoI	:	Government of India
GRC	:	Grievance Redressal Committee
HTL	:	High Tension Line
HH	:	House Hold
LARRU	:	Land Acquisition Rehabilitation and Resettlement Unit
MDR	:	Major District Road
MoEF&CC	:	Ministry of Environment, Forest and Climate Change
MoRTH	:	Ministry of Road Transport and Highways
NBWL	:	National Board for Wildlife
OP	:	Operational Policies
PIU	:	Project Implementation Unit
PMU	:	Project Management Unit
RoB	:	Rail over Bridge
RAP	:	Resettlement Action Plan
RPF	:	Resettlement Policy Framework
RoW	:	Right of Way
SEZ	:	Special Economic Zone
SEIAA	:	State Environment Impact Assessment Authority
SIA	:	Social Impact Assessment
SIPCOT	:	State Industries Promotion Corporation of Tamil Nadu
SH	:	State Highways
TNRSP	:	Tamil Nadu Road Sector Project
TNPCB	:	Tamil Nadu Pollution Control Board
ULB	:	Urban Local Body
WFPR	:	Workforce participation rate

1 Introduction

On successful completion of Tamil Nadu Road Sector Project Phase I (TNRSP I), which is a World Bank assisted Program, the GoTN has improved the State Highways for a length of about 1800 km under various improvement programs such as upgradation, enhanced periodical maintenance, performance-based maintenance, and Public-Private Partnership, etc. The GoTN is currently undertaking the second phase of works namely Tamil Nadu Road Sector Project II (TNRSP II). The total cost of the project is Rs 8500 Crores approximately. The TNRSP II shall cover upgradation, maintenance, and improvement of the identified core road network.

Accordingly, Tamil Nadu Road Sector Project – II (TNRSP-II), GoTN had already completed project preparation of roads through selected Consultants, and improvement works are being carried out under TNRSPII. Likewise, Tamil Nadu Road Sector Project (TNRSP) have decided to implement upgrading works on a further package of roads (Roads under additional financing). For this package which is proposed for Additional Financing, the project interventions include widening and strengthening of existing two-lane roads with paved shoulder and for some two-lane roads based on the traffic, it was decided to widen for 4 lane configuration with pavement strengthening with/without paved shoulders and all require drainage facility, road furniture, and accessories.

The Additional Financing will also support institutional activities and localised minor road works to improve road safety and logistics performance in the state. These construction works will be identified and designed during implementation of the Additional Financing. The TNRSPII project's Environmental Management Framework will be used during the design process to screen these civil works activities, and identify environmental risks and any mitigation measures that may be required. The project's Resettlement Policy Framework will be used to manage any land acquisition rehabilitation and resettlement that might be required due to these minor works.

The Tamil Nadu Road Sector Project has requested World Bank through DEA for additional financing to upgrade the existing State Highways and Major District Roads totalling 108.0 km under two phases. The first phase totalling 33.0 km shall have the following state highways.

Table 1: Phase – 1 Road under Package 6

Project Roads	Description	Length (km)
State Highways (SH) - 222	Omalur to Mecheri	14.6
State Highways (SH) - 30	Malliyakarai to Attur	10.1
State Highways (SH) - 15	Chithode to Erode	8.3

Source: TNRSP

The DPR's for the same has been prepared in the year 2015 to 2016, however, it was not implemented. Hence TNRSP has decided to implement the roads through updating the prepared DPR's to suit the current scenario. Due to the project readiness, the three roads have been termed as Phase – 1 roads. For other roads, the design, survey and safeguards compliance need to be initiated and hence it has been termed as Phase -2 roads. The roads that are covered under phase – 2 for 75.0 km are as follows

Table 2: Phase – 2 Roads under Package 6

Project Roads	Description	Length (km)
State Highways (SH) - 116	Kanchipuram to Cheyyar[1]	14.6
Major District Road (MDR) - 108	Erode to Chennimalai	24.0
State Highways (SH) - 139	Ariyalur to Reddipalayam	11.6
State Highways (SH) - 4	Arcot to Arani	24.8

Source: TNRSP

As per the Operational Policies (OP's) requirements of the World Bank, it is proposed to prepare Environmental and Social Impact Assessment (ESIA) for the corridors and along with the Implementable Environmental and Social Management Plan (ESMP) and the Resettlement Action Plan (RAP).

[1] Including the Vandavasi Bypass, connecting SH 116 to SH 05 (36.5 km to 39.8 km)

Road No.	Description: Project Preparation Consultancy Services for updating/preparing Detailed Project Report (DPR) for the following road works	Road Length in Km
1)	Four laning and strengthening of Kanchipuram-Cheyyar(SEZ)(km.2/915 – km. 14/112) including Vandavasi Byepass. Connecting SH 161 & SH 05 (km 36.457 to km 39.829)	14.569
2)	Four laning and strengthening of Omalur-Mecheri (SH222) (km. 0/000 – km. 14/600)	14.600
3)	Strengthening and widening of Attur-Malliyakarai road(SH30) (km.81/054 – km. 89/250)	8.196
4)	Ooty – Kothagiri – Mettupalayam – Sathy – Gobi – Erode road(SH-15) (Chithode to Erode Section) (km. 153/6 – km. 161/620)	8.020
5)	Erode – Chennimalai (MDR-108) (km. 0/00 – km. 24/000)	24.00
7)	Ariyalur – Reddipalayam (SH139) (km. 1/40 – km. 11/600)	10.2
8)	Arcot – Arni (SH4) (km. 0/00 – km. 24/600)	24.6

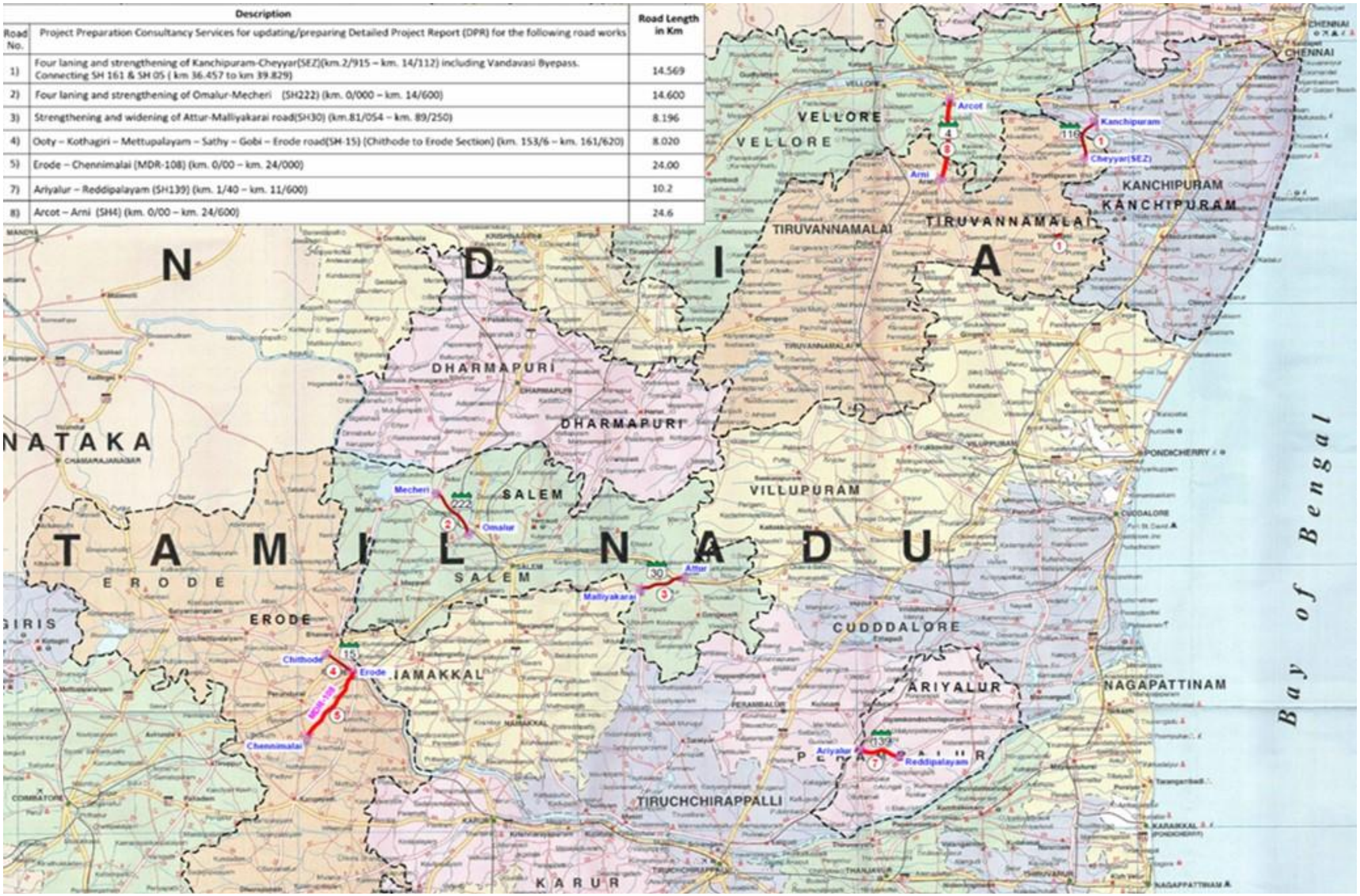


Figure 1: Location Map of Project Roads

2 TNRSP – II Project Roads (Package 6)

2.1 Project Inventory

2.1.1 Omalur – Mecheri SH 222 (km. 0/000 to km. 14/600)

The project road starts from the existing km 0/000 on SH 222 (Junction with SH-86) in Omalur and ends at the existing km 14/600 in Mecheri, project length is 14.6 km. SH-222 passes through various villages such as Omalur, Pacchanampatty, Tindamangalam, Thandavarayapuram, Paalikadai, Panjukallipatti, Chinthamaniyur, Olaipatti, Kamaneri, Chinasathapadi, Sathapadi, Pothiyampatty, Chandrama and Mecheri in Salem district.

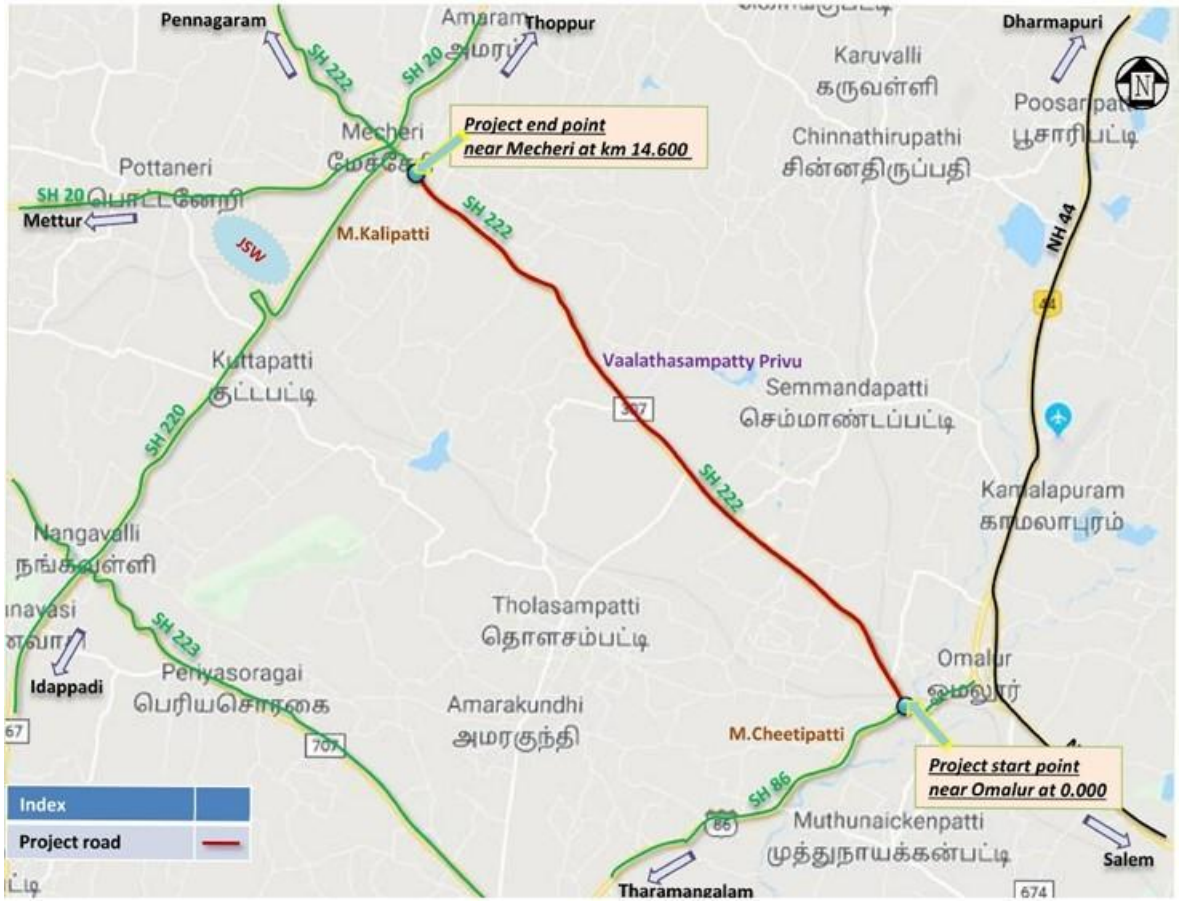
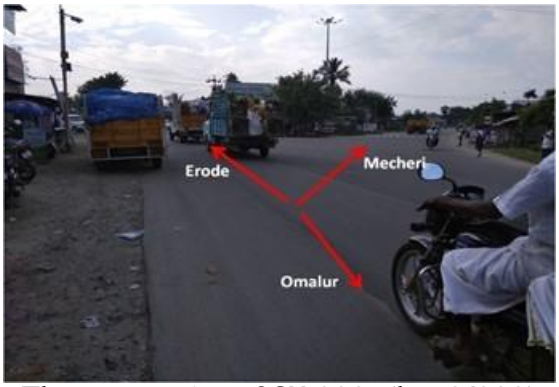


Figure 2: Location Map of Omalur – Mecheri (SH 222)



The start point of SH 222 (km 0/000)

The endpoint of SH 222 (km 14/600)

Project road forms important link between Omalur to Mecheri, it connects NH-44 and SH 86 with SH-20, MDR-347 and MDR 767. It also provide connectivity for Mettur dam, Mettur thermal power plant and other industries in and around Mettur. The existing RoW available for the SH 222 is depicted in the following table

Sl. No	Existing km		ROW in m
	From	To	
1	0/000	0/200	25.5
2	0/200	0/400	24
3	0/400	1/200	21
4	1/200	1/800	27
5	1/800	2/000	25
6	2/000	2/200	34
7	2/200	2/600	23
8	2/600	2/800	24
9	2/800	3/400	25
10	3/400	3/800	37
11	3/800	4/400	34
12	4/400	4/800	19
13	4/800	5/400	22
14	5/400	5/800	21
15	5/800	6/000	27
16	6/000	6/400	23
17	6/400	7/000	25
18	7/000	7/400	35
19	7/400	7/800	28
20	7/800	8/000	25
21	8/000	8/800	24
22	8/800	9/000	23
23	9/000	9/600	19
24	9/600	10/000	23
25	10/000	10/200	21
26	10/200	10/400	18
27	10/400	10/600	20
28	10/600	11/000	22
29	11/000	11/200	26
30	11/200	11/800	21
31	11/800	12/000	13
32	12/000	12/600	21
33	12/600	13/200	19
34	13/200	13/600	21
35	13/600	14/200	23
36	14/200	14/400	24
37	14/400	14/600	22

Source: Road Inventory, 2019

Salient Features of the SH 222

- **Landuse pattern**: The land use pattern along the project road SH 222 are built-up (55.1%), agricultural (39.7%) and barren land (5.1%), the predominant land use pattern is built-up. There is ribbon development along the road with small settlements at frequent intervals (Omalur (km 0/350), Paalikadai (km 3/350),

Panjukalipatti (km 4/000),Chinthamaniyur aprivu (km 4/800), Tharamangalam (km 6/220), Chinnasattappadi (km 8/500), Sathapadi (km 9/000) and Mecheri (km 14/000)), for which suitable road safety measures are included in the design.

- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain. Due to inadequate camber water may stagnate on the pavement surface
- **Existing Carriageway width***:* The existing section of the Project road (SH 222) has 2 lanes without paved shoulder and 4 lanes divided carriageway at few built-up sections and varied width near junctions and built-up. The average width varies from 6m to 16.5m. The existing type of pavement is flexible throughout. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.
- **Condition of Pavement and Shoulder**: The existing pavement is flexible, the general condition of the pavement varies between good to very poor. Around 56% of the pavement was observed to be in good condition. However, in some sections, the pavement is observed with alligator cracking, longitudinal cracking, edge drop & patching along the carriageway. Paved shoulder observed on either side at few built-up sections and earthen shoulders are observed throughout on either side, the width of earthen shoulder varies from 0.5m to 1m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised

Alligator cracks at km 2/000

Edge drop at km 2/600

- **Intersections**: There are one major three-legged intersections with SH-86 at the start of the project and 31 minor intersections along the project road, out of which three are four-legged Intersections and rest are three-legged.

Major Intersection (SH-86) at km 0/000

Overhead Tank on RHS at km 14/140

- **Bridges and Cross Drainage Structures**: 1 Railway Level crossing and 26 Culverts along the project stretch. There are no major or minor bridges in the project road
- **Utilities**: HTL crossing is observed at two locations (km 9/0.50 and km 9/600). A transformer is located at km 11/060 and an OHT is located at km 14/140. There are 3 Bus Shelters located at km 0/910, km 1/870 and km 2/640.
- **Sensitive Locations**: There are 4 schools, 3 hospitals, 8 temples and a graveyard observed in the project road.

Sl. No	Existing km	Religious Place	Side
1	0/390	Temple	LHS
2	0/510	Temple	LHS
3	0/840	Temple	LHS
4	1/100	Temple	LHS
5	1/100	Graveyard	RHS
5	1/460	Temple	LHS
6	3/350	Temple	RHS
7	6/200	Temple	RHS
8	8/450	Temple	LHS
9	14/600	Temple	LHS

Source: Road Inventory, 2019

Hospital on LHS at km 3/810

Temple on LHS at km 6/200

- **Strategic importance of project road:** SH 222 connects State Highway 86 (at the start of the project stretch), one Major District Road (MDR), many Other District Roads (ODR's), including village and street roads along its stretch and terminates with NH-544H. The project road also acts as one of the connecting roads for the traffic from Salem to Hogenakkal & Dhramapuri to Tiruppur.

2.1.2 Malliyakarai – Attur SH 30 (km. 81/150 to km. 91/200)

The road starts from the existing km 81/054 on SH 30 (Junction with SH 79) in Malliyakarai. Since the junction of the project road with SH 79 is recently improved up to km. 81/150 on SH 30, thus the start point of the project is considered as km 81/150. The project road length is 10.1 km SH 30 passes through Malliakarai, Eachampatti, Chockkanathapuram, Thandavarayapuram, Kamraj Nagar and Narasingapuram villages in Salem district. About 21 horizontal curves are present along the alignment, among these, some curves are observed to have insufficient sight distance and poor geometry. Project road is a missing section of Attur – Malliyakarai - Rasipuram – Trichengode – Erode road. This will connect NH 79, NH 44 and NH 544 (near Erode) and many State Highways and

MDR's. Section from Malliyakarai – Erode is developed as two lane with paved shoulder under EPC-06.

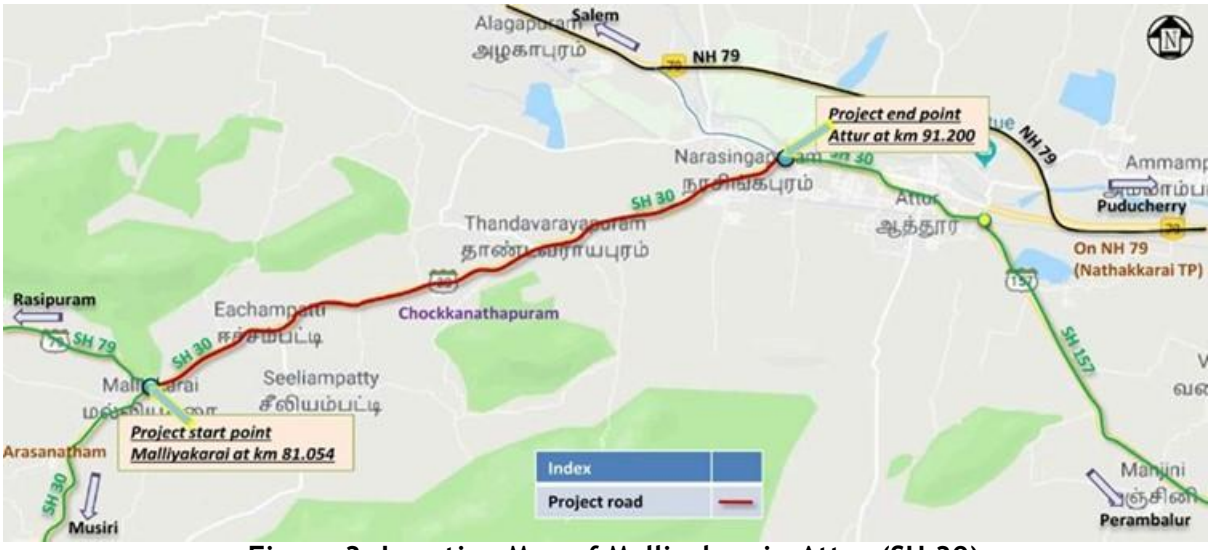


Figure 3: Location Map of Malliyakarai – Attur (SH 30)

The start point of SH 30 (km 81/054)

The endpoint of SH 30 (km 91/200)

The existing RoW available for the SH 30 is depicted in the following table

Sl. No	Existing km		ROW in m (Approx.)
	From	To	
1	81/054	81/200	20-22
2	81/200	81/600	12-15
3	81/600	83/000	15-18
4	83/000	83/800	12-15
5	83/800	87/400	15-18
6	87/400	88/000	08-10
7	88/000	88/200	15
8	88/200	91/200	15-18

Source: Road Inventory, 2019

Salient Features of the SH 30

- **Landuse pattern:** The land use patterns along the project road SH 30 are agricultural (58.0%) and built-up (42.0%), the predominant land use pattern is

agricultural. There is ribbon development along the road with small settlements at frequent intervals (Malliakarai (km 81/500), Eachampatti (83/160), Thandavarayapuram (km 87/340), Narasingapuram (km 91/100)), for which suitable road safety measures are included in the design.

- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain
- **Existing Carriageway width:** The project road (SH-30) is a 2 lane without paved shoulder throughout and have varied width near junctions and built-up sections. The existing type of pavement is flexible throughout. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.
- **Condition of Pavement and Shoulder:** The pavement is flexible, the general condition of the pavement varies between good to very poor. Around 36.92% of the pavement was observed to be in good condition. However, in some sections, the pavement is observed with alligator cracking, rutting, potholes, patching and bleeding along the carriageway. Earthen shoulders are observed on either side, the width of the earthen shoulder is 1m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised.

Alligator cracks at km 82/600

Potholes at km 86/550

- **Intersections:** There is one major 3 legged intersection with SH 79 at the start of the project and 26 minor intersections along the project road, out of which, 5 (five) are four-legged Intersections and rest are three-legged Intersections.

Major Intersection (SH 79) at km 0.000

Substation RHS at km 89/180

- **Utilities:** There are 6 transformers, 1 substation and an HTL crossing observed along the project road. There are 5 Bus Shelters located at km 81/050, km 83/160, km 84/640, km 89/180 and km 90/070.

- **Bridges and Cross Drainage Structures:** There are 2 Minor bridges at km 82/447 and km 86/430, 1 Causeway, 1 Railway level crossing (km 90/320) and 11 Culverts along the project stretch.
- **Sensitive Locations:** There are 2 schools, 2 hospitals, 5 temples and a Church which was observed in the project road.

Sl. No	Existing km	Religious Place	Side
1	82/950	Temple	LHS
2	87/390	Temple	RHS
3	88/060	Church	RHS
4	89/990	Temple	LHS
5	91/020	Temple	LHS
6	91/180	Temple	LHS

Source: Road Inventory, 2019

Church on RHS at km 88/060

School on RHS at km 82/950

- **Strategic importance of project road:** SH 30 connects State Highway 79 at the start of the project stretch and many villages and street roads as well crosses the project stretch. The project road also acts as one of the connecting roads for the traffic from Rasipuram, Thuraiyur, Tiruchirappalli to Salem, Attur and Kallakurichi.

2.1.3 Chithode to Erode SH 15 (km. 153/360 to km. 161/620)

The project road starts from the existing km 153/360 on SH 15 (Bhavani-Perundarai Main Road) and ends at the existing km 161/620 at Erode, project road length is 8.3 km. SH 15 passes through various villages such as Chithode, Kongapalayam, Naripalayam, Mamaruthu Palayam, Thannirpanthalpalayam, Periya Semur, Soolai and Veerappanchatram in Erode district. About 17 horizontal curves present along the alignment, among these, some curves are observed to have insufficient sight distance and poor geometry.

The start point of SH 15 (km 153/360)

The endpoint of SH 15 (km 161/620)

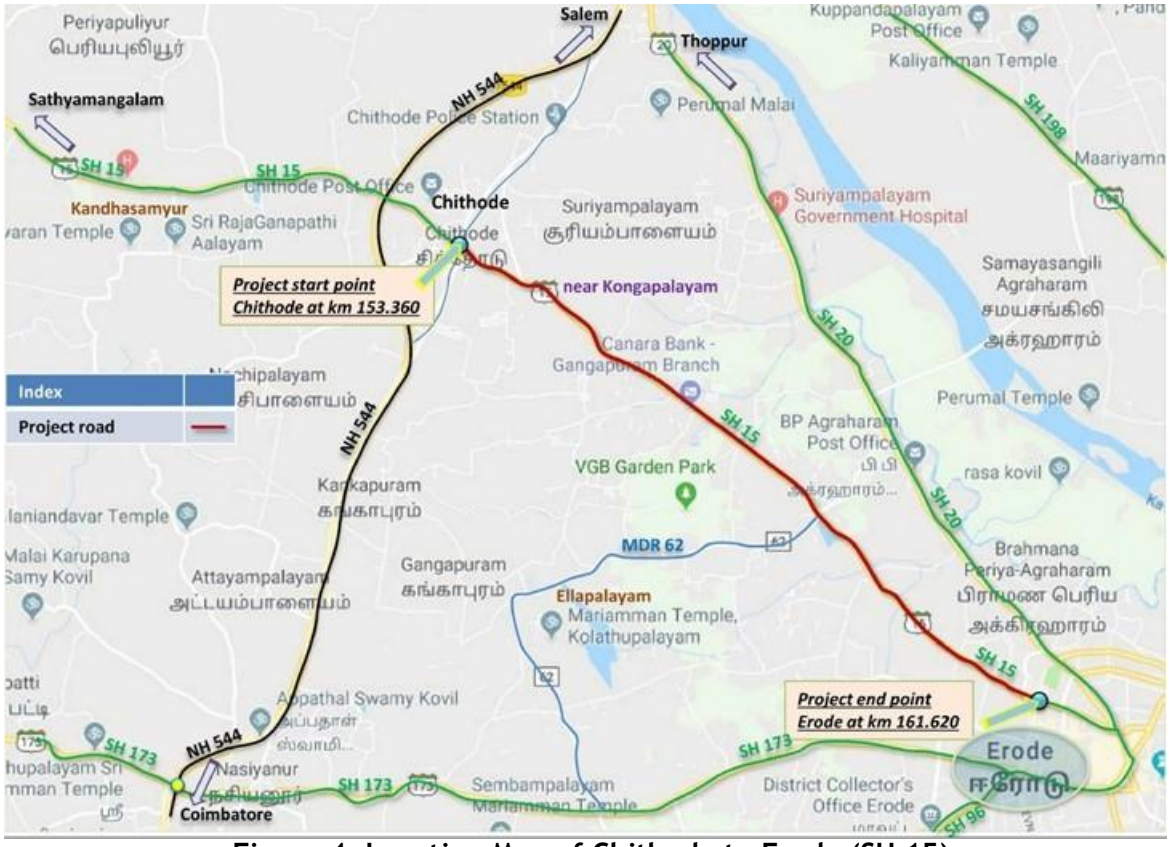


Figure 4: Location Map of Chithode to Erode (SH 15)

The road section between Gobi – Erode (km 123/000 to km 153/600) is improved under PPC-01 and the section between km 153/600 to km 161/620 is taken up for improvement under additional financing. Erode is having many spinning mills and improvement of this section provide better connectivity between Erode with NH 544. It forms connectivity between NH 544 with many State Highways and NH 381A in Erode. The existing RoW available for the SH 15 is depicted in the following table

S. No	Existing km		ERoW
	From	To	
1	153/360	153/400	34
2	153/400	153/600	21
3	153/600	153/800	26

S. No	Existing km		ERoW
	From	To	
4	153/800	154/000	27
5	154/000	154/200	29
6	154/200	154/400	34
7	154/400	154/600	34
8	154/600	154/800	23
9	154/800	155/000	24
10	155/000	155/200	23
11	155/200	155/400	33
12	155/400	155/600	26
13	155/600	155/800	28
14	155/800	156/000	30
15	156/000	156/200	18
16	156/200	156/400	24
17	156/400	156/600	28
18	156/600	156/800	27
19	156/800	157/000	37
20	157/000	157/200	29
21	157/200	157/400	31
22	157/400	157/600	30
23	157/600	157/800	30
24	157/800	158/000	30
25	158/000	158/200	26
26	158/200	158/400	25
27	158/400	158/600	22
28	158/600	158/800	21
29	158/800	159/000	23
30	159/000	159/200	19
31	159/200	159/400	19
32	159/400	159/600	27
33	159/600	159/800	29
34	159/800	160/000	30
35	160/000	160/200	25
36	160/200	160/400	31
37	160/400	160/600	21
38	160/600	160/800	33
39	160/800	161/000	23
40	161/000	161/200	22
41	161/200	161/400	23
42	161/400	161/620	26

Source: Road Inventory, 2019

Salient Features of the SH 15

- **Landuse pattern:** The land use pattern along the project road SH 15 are built-up (86.1%), Agriculture (7.3%), Barren (3.0%), Industries (1.2%) and water bodies (2.4%), the predominant land use pattern is built-up. High ribbon development

observed along the existing road for the entire stretch (Chithode (km 153/900), Kongampalayam (km 156/600), Mamarathupalayam (km 156/900), Periyasemur (km 158/040), Maligainagar (km 159/320) and Veerappanchatram (km 161/000)), for which suitable road safety measures are included in the design.

- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain. No flooding is recorded along the project stretch.
- **Existing Carriageway width:** The project road (SH 15) has 2 lane configuration with/without paved shoulder and a 4 lane divided carriageway at few built-up sections and has varied width near junctions and built-up. The existing type of pavement is flexible throughout. The average width varies from 6m to 17.5m. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.
- **Condition of Pavement and Shoulder:** The pavement is flexible, the general condition of the pavement varies between good to very poor. Around 44.3% of the pavement was observed to be in good condition. However, in some sections, it is observed with alligator cracking, longitudinal cracking, edge drop & patching along the carriageway. Paved shoulder is observed on either side at few built-up sections and earthen shoulders are observed throughout on either side, the width of the earthen shoulder varies from 0.5m to 1m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised.

Longitudinal cracking at km 154/100

Distressed pavement at km 161/200

- **Intersections:** There are 3 Major Intersections and 54 Minor Intersections along the project road, out of which, nine four-legged Intersections and rest are three-legged.

Major Intersection at km 158/400 **Overhead tank on RHS at km 155/200**

- **Utilities:** There are 12 transformers, 2 HTL crossings, 1 OHT observed along the project road. There are 4 Bus Shelters located at km 159/320, km 160/130, km 160/640 and km 161/180.
- **Bridges and Cross Drainage Structures:** There are 4 Minor bridges and 16 Culverts along the project stretch.
- **Sensitive Locations:** There are 8 temples, 5 Schools and 1 hospital which was observed along the project road.

Sl. No	Existing km	Description	Side
1	154/680	Temple	LHS
2	156/520	Temple	RHS
3	157/040	Temple	LHS
4	158/020	Temple	LHS
5	158/040	Temple	LHS
6	160/500	Temple	RHS
7	160/660	Temple	RHS
8	161/360	Temple	LHS

Source: Road Inventory, 2019

School on RHS at km 156/520

Temple on RHS at km 160/500

- **Strategic importance of project road:** SH15 passes through various villages having a significant population (such as Chithode, Kongapalayam, Mamaruthu Palayam, Thannirpanthalpalayam, Periya Semur, and Veerappanchatram), many schools, industries, government offices, religious structures and hospitals are situated along the SH 15, it connects Major District Road (MDR- 62) as well as many village and street roads along its stretch. The project stretch also connects Erode with Gobichettipalayam, Sathyamangalam, Ooty and Karnataka (Interstate connectivity).

2.1.4 Kanchipuram – Cheyyar (SEZ) SH 116 (km. 2/915 to km. 14/112) including Vandavasi bypass, connecting SH 116 & SH 05

The project road consists of two sections, the first section starts from km 2/915 on SH 116 (Sevilimedu Military road junction) and ends at km 14/112 (section length 11.2 km) on SH 116 and second section Vandavasi bypass starts from the km 36/560 on SH 116 and ends at km 56/100 on SH 05. The total length of the project road is 14.6 km. The project road (SH 116) passes through important places such as Sevilimedu, Abdullapuram, Dusi, Mamandur,

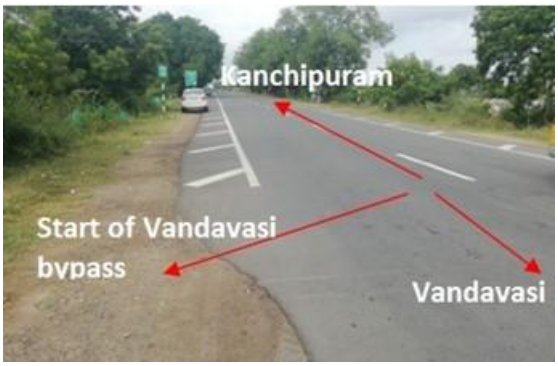
and SIPCOT in Kanchipuram and Tiruvannamalai districts. About 20 horizontal curves are present along the alignment, among these, some curves are observed to have insufficient sight distance and poor geometry.

The start point of SH 116 (km 2/915)

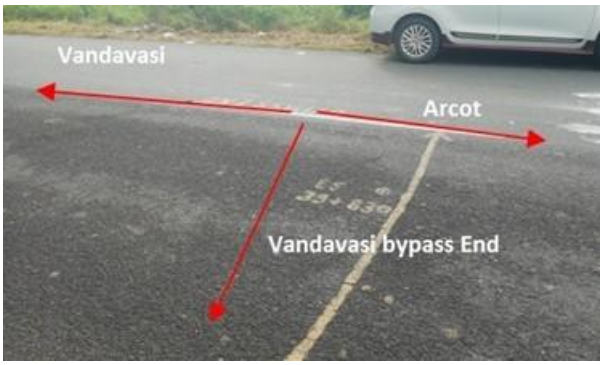
The endpoint of SH-116 (km 14/112)

First Section **Second Section**

Figure 5: Location Map of Kanchipuram – Cheyyar (SEZ) SH 116



Vandavasi bypass at km 36/560 (SH 116) – Start Point



Vandavasi bypass at km 56/100 (SH 05) – End Point

The project road is left over section of Kanchipuram - Vandavasi section of SH-116, once completed this will provide seamless movement of traffic between Kanchipuram to Vandavasi. Bypass for Vandavasi is also included for easy movement of traffic between SH 116 and SH 05. Section from Km 14/300 to Km 36/700 is already improved under EPC-01 as two lane with paved shoulder. The existing RoW available for the SH 116 is depicted in the following table

Sl.No	Existing km		ROW in m (Approx)
	From	To	
1	2/915	3/400	15
2	3/400	4/200	15-20
3	4/200	6/800	20
4	6/800	7/000	15-20
5	7/000	7/800	Dec-15
6	7/800	9/600	20-25
7	9/600	11/000	Oct-15
8	11/000	13/000	20-25
9	13/000	13/600	25-30
10	13/600	14/300	20-25

Source: Road Inventory, 2019

Salient Features of the SH 116

- **Landuse pattern:** The land use pattern in SH 116 is dominated by the Built-up section (52.2%), Agricultural (33.8%), water body (8.3%) and Industrial land use (5.7%). The land use on the proposed Vandavasi bypass is entirely Agricultural. There is ribbon development along major sections of the road with settlements at frequent intervals (Selvimedu (km 2/915), Punjai Arasanthangal (km 5/700), Abdullapuram (km 6/700), Dusi (km 7/700), Mamundur (km 10/000) and Cheyyar SPICOT (km 13/000)), for which suitable road safety measures are included in the design.
- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain. As per the Tamil Nadu Wind Hazards & Risk zones (*Source: BMTPC, Vulnerability Atlas; 2 Ed., and Cyclone Data (1877-2017*), the project stretch comes under moderate damage risk zone. No flooding is recorded along the project stretch.

- **Existing Carriageway width:** The Project road (SH 116) has a 2 lane without paved shoulder in almost the entire section and have varied width near major junctions and SIPCOT. The existing type of pavement is flexible throughout. The average width varies

from 7m to 15m. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.

Very poor pavement condition at km 6/300

Very poor pavement condition at km 9/000

- **Condition of Pavement and Shoulder:** The existing pavement is flexible, the general condition of the pavement varies between Good to very poor. Nearly 39% of the pavement is in very poor condition. The pavement is observed with a lot of Alligator cracks, raveling, potholes, and edge drops. Earthen shoulders are observed on either side, the width of the earthen shoulder varies from 1 to 2.3 m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised.
    - **Intersections:** There are 6 major intersections (all 3-legged intersections) and 51 minor intersections along the project road, out of which, seven are four-legged Intersections and rest are three-legged Intersections.

Major Intersection at km 4/140

Bus Shelter on RHS at km 13/010

    - **Utilities:** There are 5 transformers, 1 HTL crossings, 4 OHT and 2 bore wells observed along the project road. There are 11 Bus Shelters located Km 3/150, Km 5/380, Km 5/460, Km 5/550, Km 6/250, Km 6/650, Km 6/900, Km 7/500, Km 12/300, Km 13/010 and Km 14/010.
- **Bridges and Cross Drainage Structures:** There is 1 Major bridge, 2 Minor bridges and 28 Culverts along the project stretch.

Major Bridge at Km 4/876 (SH 116)

Minor Bridge at Km 8/940 (SH 116)

- **Sensitive Locations:** There are 23 temples, 1 graveyard, 1 mosque, 3 Schools/college, and 3 hospitals were observed along the project road.

Temple on RHS at km 5/700

Statues on RHS at km 10/850

- **Strategic importance of project road:** SH-116 passes through habitations as Sevilimedu, Abdullapuram, Dusi in Kanchipuram district and Mamandur, SIPCOT SEZ in Tiruvannamalai district, it connects State Highway (SH-5A), Major District Roads (MDR-143 and 564) and many ODR & village roads. SH 116 also acts as a major connecting road for the traffic from SIPCOT SEZ to Kanchipuram and in turn to Chennai and Bangalore, also an interstate connection to Andhra Pradesh.

2.1.5 Erode – Chennimalai MDR 108 (km. 0/000 to km. 24/000)

The project road starts from the km 0/000 on MDR-108 (Erode Railway Station Junction) in Erode and ends at km 24/000 in Chennimalai. The project road length is 24 km. The project road passes through various villages/places such as Erode, Kasipalayam, KK Nagar, Rangapalayam, Senathipathipalayam, Mutham Palayam, Kavundachipalayam, Vellode, Thaneerpanthal, Mayladi, Mukasipidariyur, Poonga Nagar and Chennimalai in Erode district. About 46 horizontal curves are present along the alignment, among these, some curves are observed to have insufficient sight distance and poor geometry. This road connects one of the important pilgrimage place (Chennimalai) with Erode. Once it is developed, it will function like an alternate route to Erode – Chitode road. This road connects many State Highways & NH 381 A at Erode with SH 96 at Chennimalai.

Figure 6: Location Map of Erode – Chennimalai (MDR 108)

The start point of MDR-108 (km 0/000)

The endpoint of MDR-108 (km 24/000)

The existing RoW available for the MDR 108 is depicted in the following table

Sl. No	Existing km		ROW in m (Approx.)
	From	To	
1	0/000	0/400	18-20
2	0/400	1/600	15-18
3	1/600	2/000	18-20

Sl. No	Existing km		ROW in m (Approx.)
	From	To	
4	2/000	2/800	15-18
5	2/800	3/200	10-12
6	3/200	3/400	12-15
7	3/400	4/200	15-18
8	4/200	4/600	20-22
9	4/600	4/800	18-20
10	4/800	6/800	15-18
11	6/800	7/600	12-15
12	7/600	12/000	15-18
13	12/000	12/200	12-15
14	12/200	13/000	15-18
15	13/000	14/000	12-15
16	14/000	15/000	15-18
17	15/000	15/600	12-15
18	15/600	18/000	15-18
19	18/000	18/600	12-15
20	18/600	20/000	15-18
21	20/000	20/600	12-15
22	20/600	21/800	15-18
23	21/800	23/000	12-15
24	23/000	24/000	15-18

Source: Road Inventory, 2019

Salient Features of the MDR 108

- **Landuse pattern:** The land use pattern along the project road MDR-108 are built-up (41%), agricultural (38.1%), barren (16.7%), water bodies (0.4%) and railway line (3.8%), the predominant land use pattern is built-up sections. There is ribbon development along the road with small settlements at frequent intervals (Erode (km 1/100), Kasipaalayam (km 2/000), Rangapalayam (km 3/000), Mutham palayam (km 6/000), Kauvundachipalayam (km 9/000), Vellode (km 14/000), Mayiladi (km 19/200) and Chennimalai (km 24/000)), for which suitable road safety measures are included in the design.
- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain. A lined drain crosses the RUB at Km 2+900, as the drain size is inefficient to cater to the flow of water, in case of excess discharge, water spills out of drain thereby causing flooding at RUB locations
- **Existing Carriageway width:** The Project road (MDR-108) has 2 lanes with/without paved shoulder and 4 lanes divided carriageway at few sections and varied width near junctions and built-up. The existing type of pavement is flexible throughout. The average width varies from 6.5m to 17m. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.
- **Condition of Pavement and Shoulder:** The pavement is flexible, the general condition of the pavement varies between good to Poor. Around 86% of the pavement is in good condition only a few portions of the stretch is observed with alligator cracking, longitudinal cracking, edge drop, potholes & bleeding along the carriageway. The paved shoulder was observed on either side at few built-up

sections and earthen shoulders were observed throughout on either side, the width of the earthen shoulder varies from 0.5m to 1m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised.

Bleeding at km 16/900

Pothole at km 11/600

Major Intersection (MDR-883) at km 12/660

Overhead tank on RHS at km 1/060

- **Intersections:** There are 5 Major Intersections (4 no's of 3-legged intersections and 1 no. of 4 legged intersections) and 49 Minor Intersections along the project road, out of which 4 are four-legged Intersections and rest are three-legged Intersections.
- **Utilities:** There are 16 transformers, 1 HTL crossings, 2 OHT observed along the project road. There are 12 Bus Shelters located at km 1/410, km 1/670, km 9/100, km 9/360, km 11/000, km 17/200, km 18/200, km 19/250, km 19/250, km 21/390, km 22/560 and km 23/560.
- **Bridges and Cross Drainage Structures:** There are 5 Minor bridges, 1 Road under Bridge (RUB) and 35 Culverts present along the project stretch.
- **Sensitive Locations:** There are 20 temples, 7 Schools and 2 hospitals that were observed along the project road. Vellode Bird Sanctuary is located at km 10.98 (approx. 1.4km from project road)

Temple on RHS at km 9/360

School on LHS at km 21/530

Primary Health Center on RHS at km 13/340

Vellode Bird Sanctuary on RHS at km 10/980

- **Strategic importance of project road:** MDR 108 passes through various villages and key urban areas, it connects State Highway 84A & State Highway 86 at the start point and endpoint of the project respectively, Major District Road 883, Major District Road 990 and many village and street roads along its stretch. Chennimalai is an important religious town having Lord Murugan temple at top of the hill, during the festive season in February month, pilgrims visit the temple through the project road. It also connects Erode with Tiruppur and Pollachi districts. Many Schools, Religious Structures and Hospitals are situated along the MDR 108.

2.1.6 Ariyalur – Reddipalayam SH 139 (km. 0/000 to km. 11/600)

The project road starts from the km 0/000 on SH 139 and ends at the km 11/600 on SH 139 (Junction with NH 81) near Reedipalayam. The total length of the project road is 11.6 km. The project road passes through important places such as Ariyalur, Valajanagaram, Venkatkrishnapuram, Hastinapuram, Kattupiringiyam, Palatanai and Reddipalayam in Ariyalur district. About 33 horizontal curves are present along the alignment. Among these, some curves are observed to have insufficient sight distance and poor geometry. This project connect NH 136 with NH 81, Cement factory and lime queries are present in this road. Improvement of this road will provide better connectivity transportation of raw material and finished goods.

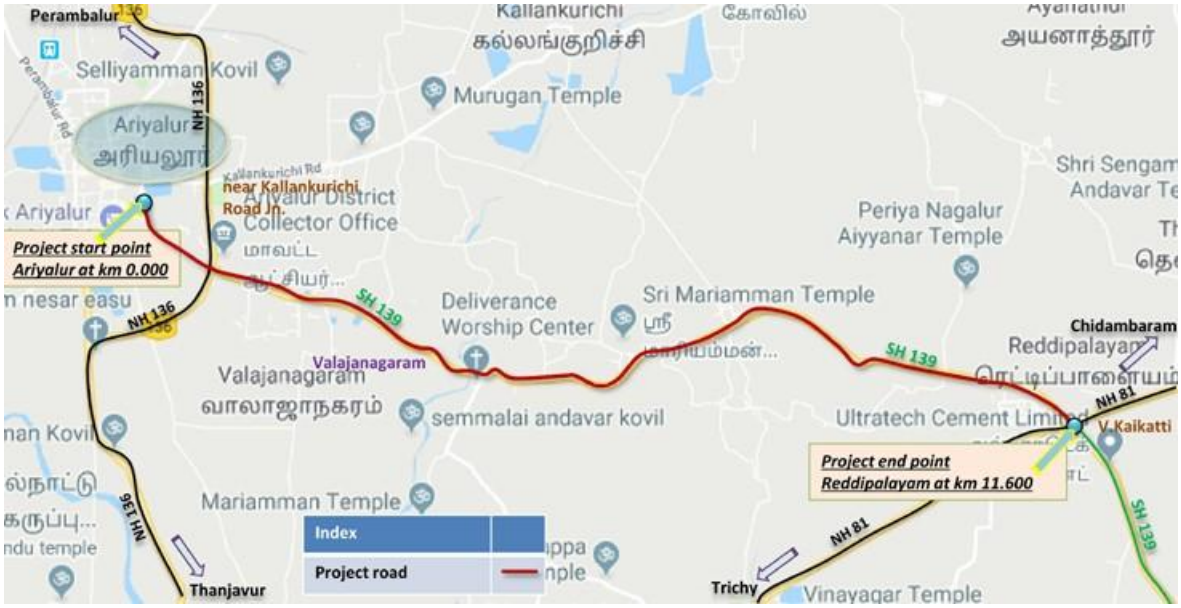


Figure 7: Location Map of Ariyalur – Reddipalayam (SH 139)

The start point of SH 139 (km 0/000)

The endpoint of SH 139 (km 11/600)

The existing RoW available for the SH 139 is depicted in the following table

Sl No	Existing km		EROW (m)
	From	To	
1	0/000	0/200	21 to 28
2	0/200	0/400	22 to 32
3	0/400	0/600	22 to 30
4	0/600	0/800	20 to 25
5	0/800	1/000	18 to 21
6	1/000	1/200	23 to 35
7	1/200	1/400	37 to 50
8	1/400	1/600	20 to 25
9	1/600	3/600	20
10	3/600	4/000	40
11	4/000	4/200	28
12	4/200	5/000	24

Sl No	Existing km		EROW (m)
	From	To	
13	5/000	5/400	20
14	5/400	5/800	18
15	5/800	6/400	23
16	6/400	6/800	25
17	6/800	7/000	30
18	7/000	7/400	38
19	7/400	7/000	30 to 35
20	7/600	7/800	30 to 40
21	7/800	8/000	40
22	8/000	8/200	30 to 40
23	8/200	8/600	30 to 35
24	8/600	9/000	25 to 30
25	9/000	9/200	30 to 35
26	9/200	9/800	28 to 30
27	9/800	10/200	30 to 33
28	10/200	10/400	35 to 40
29	10/400	11/000	30 to 35
30	11/000	11/600	25 to 30

Source: Road Inventory, 2019

Salient Features of the SH 139

- **Landuse pattern:** The land use pattern along the project road SH 139 is dominated by Agricultural (51.7%), Built-up section (41%), Quarry (5.2%) and Water bodies (2.2%). Stone quarries and cement factories are observed along the existing road. There is ribbon development along the road with small settlements at frequent intervals (Ariyalur (km 1/200), Valajanagram)km 2/800), Venkatakrishnapuram (km 3/000), Astinapuram (km 6/000), Kattupiringiyam (km 7/400) and Reddipalayam (km 11/000)), for which suitable road safety measures are included in the design.
- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain, No flooding is recorded along the project road.
- **Existing Carriageway width:** Except in the Ariyalur Built-up section, where it has 4 lanes divided carriageway, the project road (SH 139) has only 2 lane configuration with the paved shoulder for the entire section. The existing type of pavement is flexible throughout the project road. The average width varies from 7m to 15m. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.
- **Condition of Pavement and Shoulder:** The existing pavement is flexible, the general condition of the pavement varies between Good to Poor. Around 79% of the pavement is in fair condition and the remaining stretches are observed with Ravelling and Patching. Earthen shoulders are observed on either side, the width of the earthen shoulder varies between 1 to 2m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised.

Good pavement condition at km 1/200

Raveling at km 10/600

- **Intersections:** There are 3 Major Intersections (2 no's of 4-legged intersections and 1 no. of 3 legged intersections) and 48 Minor Intersections along the project road, out of which, ten are four-legged Intersections and rest are three-legged Intersections.

Major Intersection at km 1/300

Overhead tank on LHS at km 8/230

- **Utilities:** There are 11 transformers, 3 HTL crossings, 2 OHT observed along the project road. There are 11 Bus Shelters located at km 0/050, Km 0/450, Km 1/000, Km 1/390, Km 1/400, Km 4/560, Km 5/900, Km 6/250, Km 6/430, Km 7/500 and Km 7/550.
- **Bridges and Cross Drainage Structures:** There are 2 Minor bridges (at km 4/405 and 9/135) and 14 Culverts along the project road.
- **Sensitive Locations:** There are 10 temples, 5 Schools/college and 1 hospital observed along the project road.

Sl. No	Existing km	Description	Side
1	0/100	Temple	LHS
2	1/050	Temple	LHS
3	1/650	Shrine	RHS
4	2/270	Temple	BHS
5	3/100	Temple	RHS
6	5/950	Temple	LHS
7	5/970	Temple	RHS
8	6/050	Temple	LHS
9	8/100	Temple	RHS

Sl. No	Existing km	Description	Side
10	11/450	Temple	RHS

Source: Road Inventory, 2019

Temple on RHS at km 2/270

School on RHS at km 9/950

- **Strategic importance of project road:** SH 139 passes through important places such as Ariyalur, Valajanagaram, Venkatkrishnapuram, Hastinapuram, Kattupiringiyam, Palatanai and Reddipalayam in Ariyalur district, it connects National Highways (NH 136, NH 81) and many ODR & village roads. Along the SH 139, there are 7 Lime Stone quarries (distributed in Periyanagalur, Kattupringiam, and Reddipalayam) and 4 cement factories (Dalmaiya, Ultratech, Ramco, and TANCEM). Many Schools, Religious Structures and Hospitals are also situated along the SH 139.

2.1.7 Arcot – Arni SH 04 (km. 0/000 to km. 24/800)

The project road starts from the km 0/000 on SH 04 (Junction with SH-129) and ends at the km 24/800 on SH-04 (Start of Arni bypass- 4 legged Junction), the total length of the project road is 24.8 km. The project road (SH-04) passes through Arcot, Timiri, Mosur, Thamaraipakkam and Irumbedu (Arni) in Ranipet (Old Vellore) and Tiruvannamalai districts.

The start point of SH 04 (km 0/000)

The endpoint of SH 04 (km 24/800)

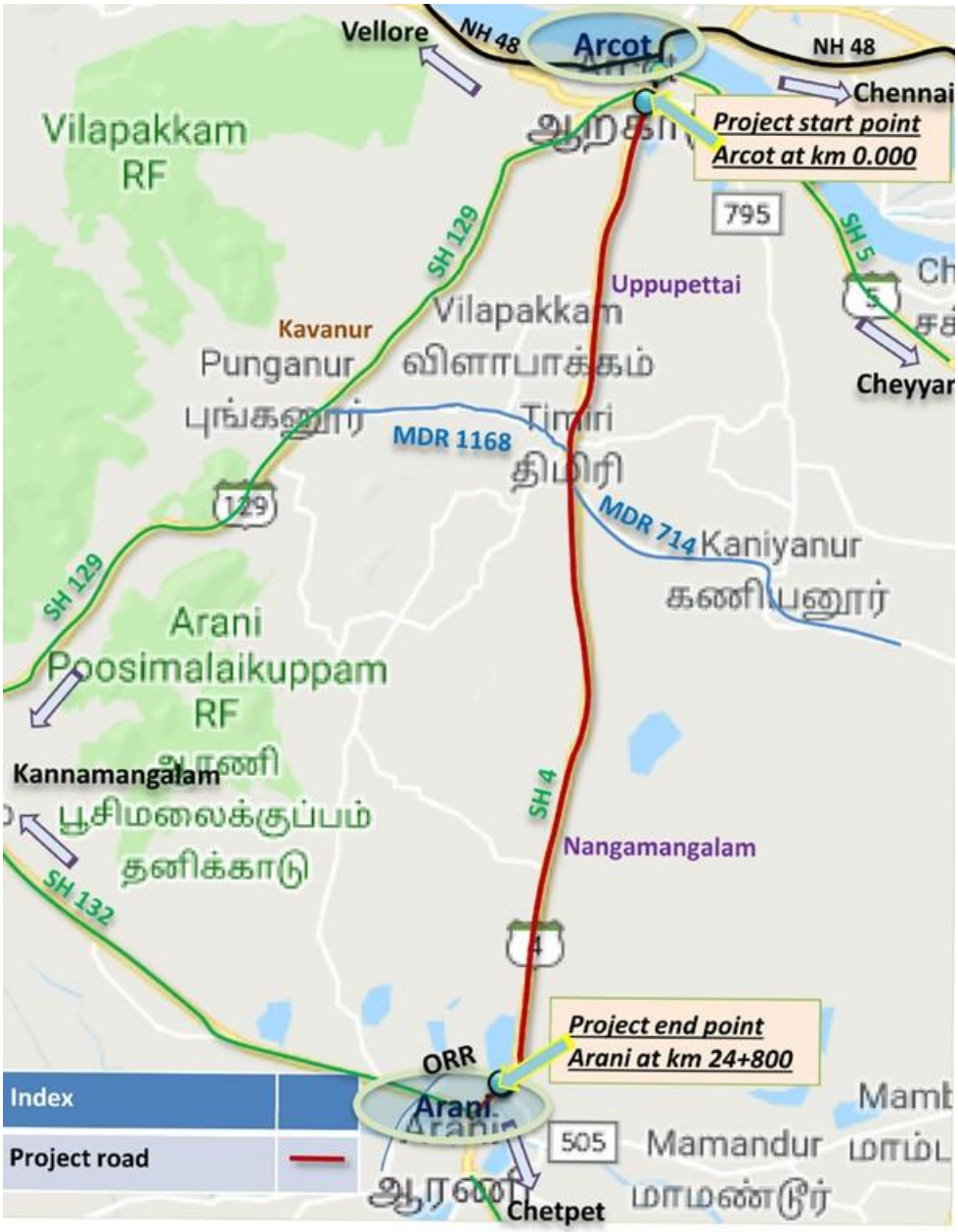


Figure 8: Location Map of Arcot – Arni (SH 04)

This road is important link for traffic moving between Chennai – Tiruvannamalai and connects NH 48 with SH 132. Development of this link will also provide alternative road between Channai – Salem via Arcot – Arani – Polur – Chengam – Harur. Project road is already improved as two lane with paved shoulder under EPC-02. The existing RoW available for the SH 04 is depicted in the following table

Sl. No	Existing km		ROW in m (Approx.)
	From	To	
1	0/000	1/200	12-15
2	1/200	3/200	20-25
3	4/200	3/400	15-20
4	3/400	4/200	20-25
5	4/200	7/400	25-30
6	7/400	8/000	20

Sl. No	Existing km		ROW in m (Approx.)
	From	To	
7	8/000	8/400	15-20
8	8/400	9/200	12-15
9	9/200	10/200	15-20
10	10/200	14/600	25-30
11	14/600	16/200	15-20
12	16/200	16/600	12-15
13	16/600	17/600	25-30
14	17/600	24/800	20-25

Source: Road Inventory, 2019

Salient Features of the SH 04

- **Landuse pattern:** The land use pattern along the project road SH 04 is dominated by agriculture (58.9%), Built-up section (33.9%), water bodies (6%) and Industrial land use (1.2%). There is ribbon development along the road with small settlements at frequent intervals (Arcot (km 0/000), Thoppukana (km1/100), Uppupet (km 3/500), Timiri (km 8/000), Vilari (km 9/700), Thamaraipakkam (km 6/000), Velleri (km 19/100) and Erumbedu (km 24/800)), for which suitable road safety measures are included in the design.
- **Existing Drainage system**: Earthen drain is present along the entire stretch with isolated stretches having RCC drain, No flooding is recorded along the project road.
- **Existing Carriageway width:** The existing section of the project road (SH 04) has 2 lane configuration with the paved shoulder in almost the entire section and varied width is observed near junctions and built-up sections. The existing type of pavement is flexible throughout. The average carriage width ranges from 7m to 10m. The existing road level at the built-up section is in line with the adjacent area/ surrounding areas.
- **Condition of Pavement and Shoulder:** The existing pavement is flexible, the general condition of the pavement varies between Good to Very Poor. Nearly 50% of the pavement is observed to be in good condition. The other 50% of the pavement is observed with Alligator cracks, potholes and Bleeding in the wheel path. Earthen shoulders are observed on either side, the width of the earthen shoulder is 1m. Based on the existing crust composition and the engineering studies, the use of existing pavement materials will be finalised.

Alligator cracks at km 4/400

Potholes at km 10/200

- **Intersections:** There are 4 Major Intersections (3 no's of 3-legged intersections and 1 no. of 4 legged intersections) and 77 Minor Intersections along the project road,

out of which, thirteen are four-legged Intersections and rest are three-legged Intersections.

Major Intersection at km 0/000

Overhead tank on LHS at km 12/020

- **Utilities:** There are 42 transformers, 1 Substation, 4 HTL crossings, 5 OHT, 16 water storage tank and 4 bore wells observed along the project road. There are 26 Bus Shelters available in the project road.
- **Bridges and Cross Drainage Structures:** There are 12 Minor bridges and 44 Culverts present along the project stretch.

Minor Bridge at Km 2/200 (SH 04)

Minor Bridge at Km 4/400 (SH 04)

- **Sensitive Locations:** There are 33 temples, 1 mosque, 1 church, 3 temple arches, 16 Schools/college and 1 hospital observed along the project road.

Temple on RHS at km 12/500

Mosque on LHS at km 24/360

- **Strategic Importance of Project Road:** SH 04 passes through important places such as Arcot, Timiri, Mosur, Thamaraipakkam and Irumbedu (Arni) in Ranipet (Old

Vellore) and Tiruvannamalai districts, it connects State Highway (SH 129), Major District Roads (MDR-1168, 714 and 505) and many ODR & village roads. Arni is famous for silk production and improvement of project road will increase the connectivity to Karnataka and Andhra Pradesh state. The project road also acts as a connecting road for the traffic from Vellore and Kanchipuram to Polur, Chetpet and Tiruvanamalai.

2.2 Proposed Interventions

Table 3: Proposed Interventions

Sl.no	Project Roads	Existing Carriage Way	Proposed Carriage Way
1.	Omalur to Mecheri Road (SH 222)	2 lane without paved shoulder and 4 lanes divided carriageway at few built-up sections and varied width near junctions and built-up	4 lane configuration with paved shoulder
2.	Malliyakarai to Attur Road (SH 30)	2 lane without paved shoulder throughout and varied width near junctions and built-ups	2 lane configuration with paved shoulder
3.	Chithode to Erode Road (SH 15)	2 lane with/without paved shoulder and 4 lanes divided carriageway at few built-up sections and varied width near junctions and built-up	4 lane configuration with paved shoulder
4.	Kanchipuram to Cheyyar Road (SH 116)	2 lane without paved shoulder in almost entire section and varied width near major junctions and near SIPCOT	4 lane configuration with paved shoulder
5.	Erode to Chennimalai Road (MDR 108)	2 lane with/without paved shoulder and 4 lanes divided carriageway at few sections and varied width near junctions and built-up	2 lane configuration with paved shoulder
6.	Ariyalur to Reddipalayam Road (SH 139)	2 lane with the paved shoulder in almost entire section except in Ariyalur Built-up where it is 4 lanes divided carriageway	4 lane configuration with paved shoulder
7.	Arcot to Arni Road (SH 4)	2 lane with the paved shoulder in almost entire section and varied width near junctions and built-up	4 lane configuration with paved shoulder, if it has sufficient traffic

Source: TNRSP

For the project roads (SH 222, SH 30, and SH 15), where the DPR's were already prepared in the year 2015 to 2016 were reviewed for further updation to suit the current condition. As per the design analysis, no major difference is observed concerning the proposed alignment in comparison to the earlier design, however, the pavement design is subjected to marginal changes, the difference between the proposed pavement compositions in comparison with the earlier pavement composition is given in the following table. Since there is no much difference concerning the proposed alignment and design, any further change in the scope of the environmental and social assessment is not envisaged.

(i) Omalur-Mecheri Road (SH 222)

Sl No	Pavement Layer	Thickness (Previously Proposed)	Thickness (Proposed)
1	BC	40	40
2	DBM	80	**100**
3	WMM	250	250
4	GSB	200	200

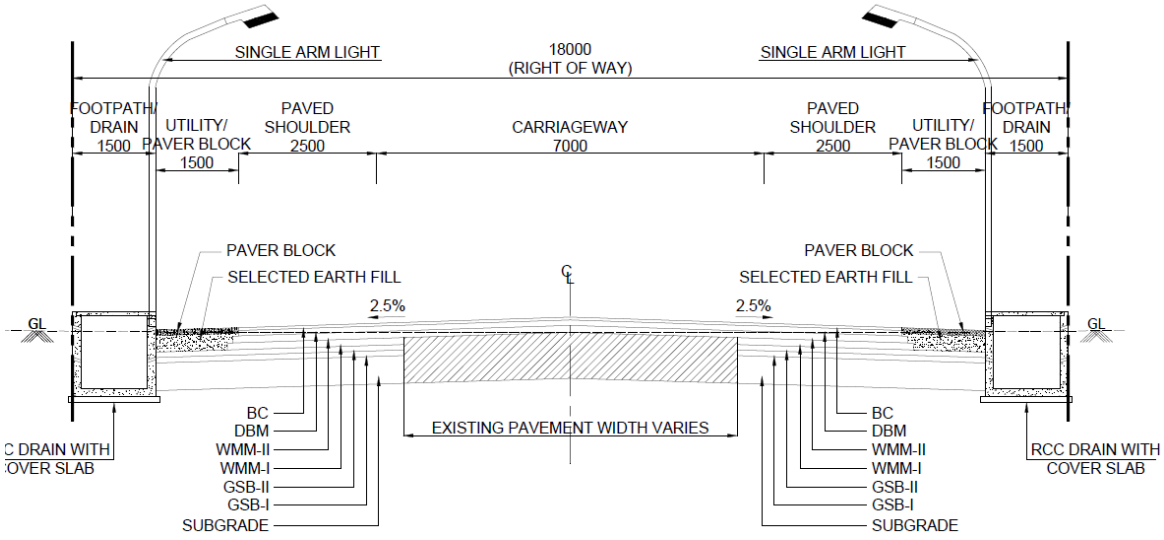
(ii) Malliyakarai – Attur Road (SH 30)

Sl. No	Pavement Layer	Thickness (Previously Proposed)	Thickness (Proposed)
1	BC	40	40
2	DBM	75	**105**
3	WMM	250	250
4	GSB	200	200

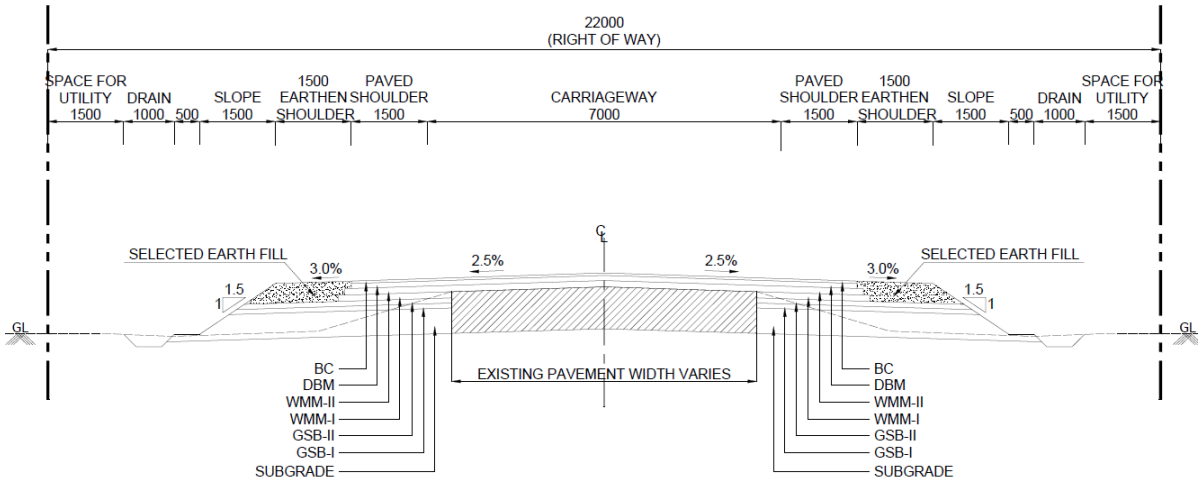
(iii) Chithode-Erode Road (SH 15)

Sl No	Pavement Layer	Thickness (Previously Proposed)	Thickness (Proposed)
1	BC	40	40
2	DBM	60	**80**
3	WMM	250	250
4	GSB	200	200

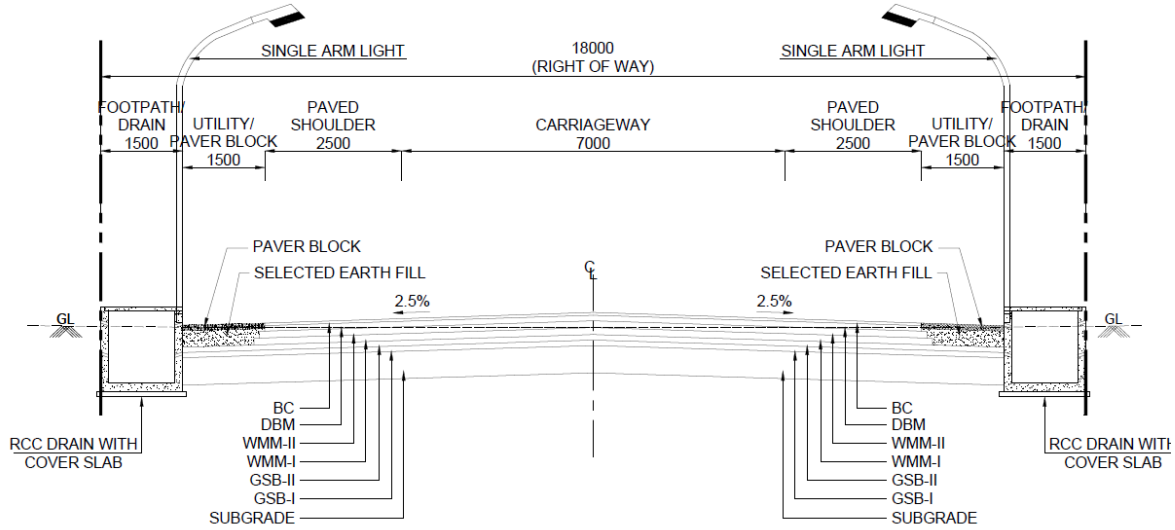
2.2.1 Proposed 2 Lane Configuration for SH 30 and MDR 108



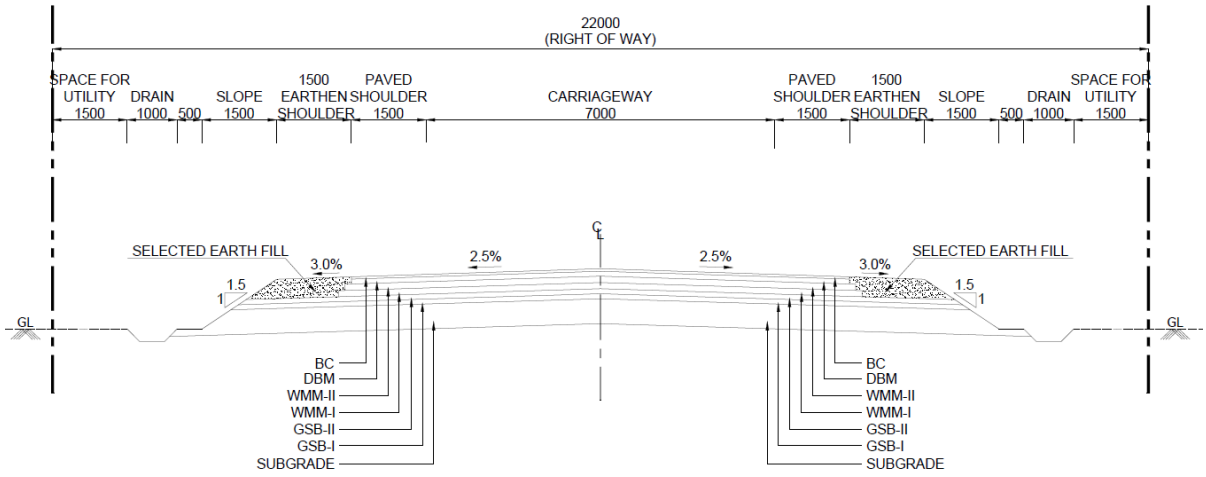
2 Lane with Pave Shoulder – Concentric Widening (Built-Up Section)



2 Lane with Pave Shoulder – Concentric Widening (Rural Section)

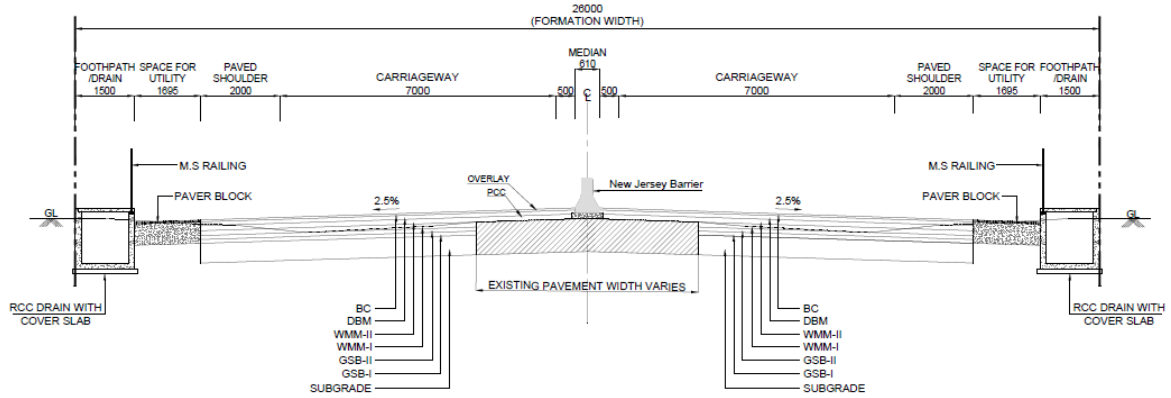


2 Lane with Pave Shoulder (Built-Up Section) – Realignment

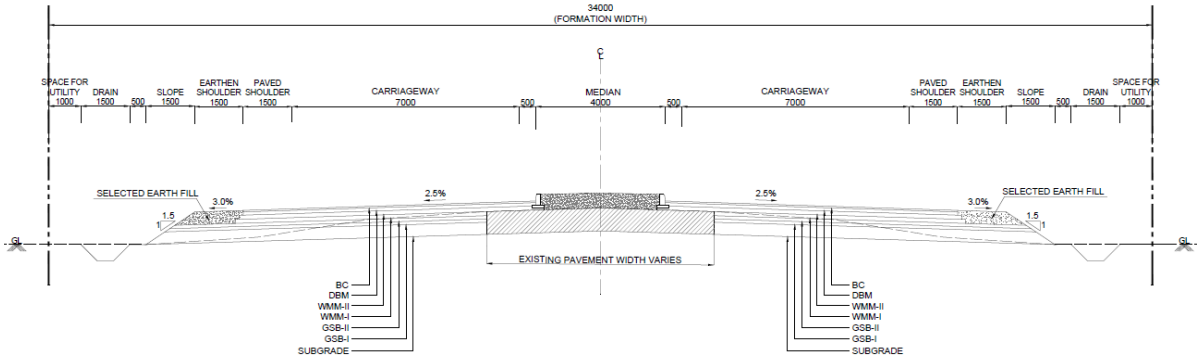


2 Lane with Pave Shoulder (Rural Section) – Realignment

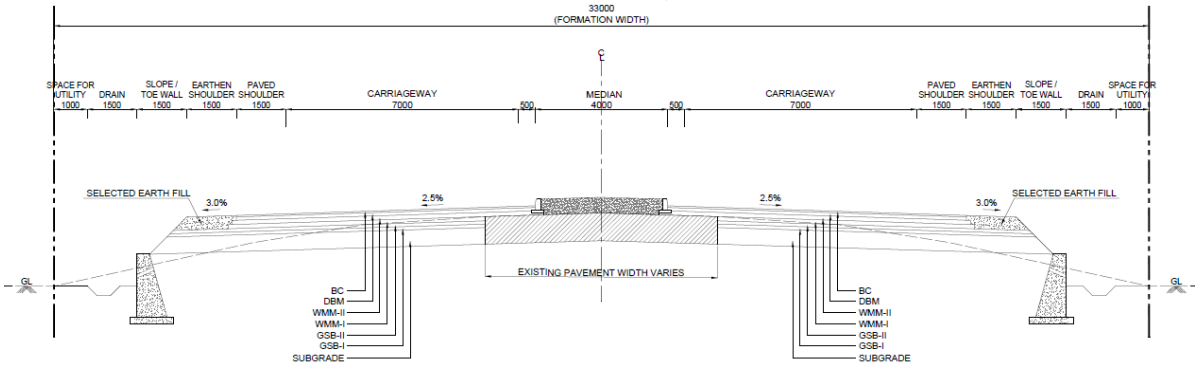
2.2.2 Proposed 4 Lane Configuration for SH 222, SH 15, SH 116, SH 139 and SH 4



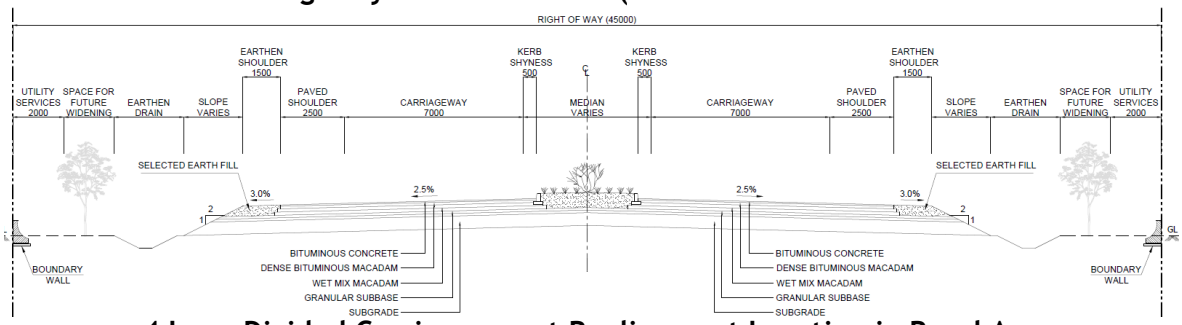
4 Lane Divided Carriageway – Built-Up Sections



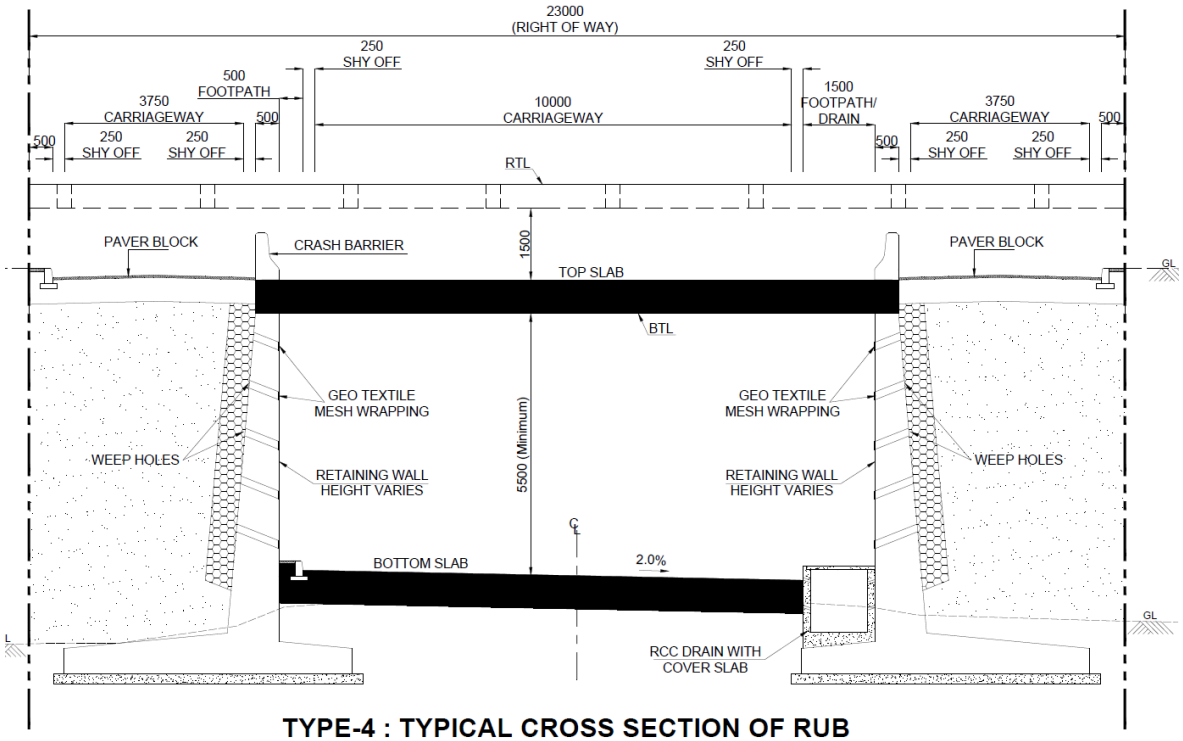
4 Lane Divided Carriageway – Rural Sections (Difference beween OGL & FRL <1m



4 Lane Divided Carriageway – Rural Sections (Difference beween OGL & FRL >1m



4 Lane Divided Carriageway at Realignment Location in Rural Area



TYPE-4 : TYPICAL CROSS SECTION OF RUB

Typical Cross Section for RUB

2.2.3 Scope for Reclaiming and Reuse Material from Existing Road Pavement

Based on the inventory survey carried out along the project corridors, the existing pavement type is observed to be flexible and having several destresses, which may be the result of insufficient pavement layers, improper design and also change in vehicular traffic type. During crust cutting carried out along the project corridors, it was observed that the pavement layer thickness is insufficient. Thus, it was suggested to reconstruct the pavement as per the design carried out based on the latest IRC codes. The details of reclaiming and reuse of materials from existing pavement layers are as follows,

a. The existing road will be dug till the end of the proposed subgrade bottom and the existing subgrade will be used as filling in the widened portion of the road as embankment, subject to the field study & need.

b. The base course in the existing roads may be considered to be used for the construction of diversion roads, raising the crossroads, as a soling layer below cross drainage structures if the soil is weak.

c. The surface course which is of bituminous type may be broken and separated from the bitumen coating and based on gradation, the aggregates can be used in base/sub base layers. It can also be used for the construction of bituminous layers in low-intensity traffic roads such as village roads. Suitability of the material for use in different pavement layers shall be properly assessed before using it in any layer. However, the cost and time involved in the reuse of the bituminous layer are high and tedious. This option maybe explored.

The suggested measures shall be studied in detail for estimating the quantities of reusable materials during the design stage/ DPR and the outcomes shall be given in the corridor specific ESIA.

3 Purpose of the ESIA

The project roads have been assigned category "A" in accordance with World Bank's Operational Policy OP 4.01 (Environmental Assessment) and mandate the preparation of project-specific Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). Similarly, in accordance with World Bank's Operational Policy OP 4.12 (Involuntary Resettlement), this project mandates the preparation of the Social Impact Assessment (SIA) and Resettlement Action Plan (RAP). Accordingly, detailed assessments of the environmental and social impacts have been carried out following a suitable methodology.

This ESIA shall cover, the environmental and social impacts due to the project, concerning construction-related environmental impacts, infringements with natural habitats and places of cultural heritage also in the context of 'chance-find', and impacts on local population/ community. The findings of ESIA will guide the effective development of the specific ESMP and facilitate the implementation of safeguard measures appropriately.

3.1 The approach followed for conducting ESIA study

Project roads spread across 6 districts in the state of Tamil Nadu. To identify the environmental and social issues arising out of the current practices adopted for planning, design, and construction of the project roads, the environmental and social conditions along the project roads were assessed. During these visits, consultations through group discussions with local communities, road users and panchayat/ village members were contacted to understand their perceptions and needs. A standard methodology was adopted for fulfilling the ESIA requirements; key features/tasks of the methodology are detailed as follows:

Task 1: Field Reconnaissance Survey and Review of Earlier Studies

The field reconnaissance survey has been carried out along the project roads to understand salient environmental and social features that are likely to cause adverse impacts, sensitive environmental and social issues via-a-vis proposed project interventions. The salient feature includes

- The topography of the land, road geometry
- Environmental features like trees, any forest area, water bodies like ponds, rivers, etc.
- A social and physical feature like settlement pattern, its density, typology of buildings, especially the presence of religious buildings, land use, etc.

Experience of EIA, EMP, SIA, RAP study, as well as the implementation of EMP, was also taken into account from earlier TNRSP projects.

Task 2: Review and Assessment of Applicable Environmental and Social Regulations

Various rules/regulations and guidelines applicable to the project roads vis-à-vis center (GoI), state (GoTN) and World Bank statutory requirements were reviewed and referred to for assessing current environmental and social impacts that are likely to emanate.

Task 3: Delineation of Study Area for Assessment

In road projects, while the influence area may vary via-a-vis size of the road, location of the road, type of road, etc., hence, the study area was fixed based on the proposed interventions including the road sections undergoing widening and strengthening, RoW availability, structural works (culverts and bridges), presence of sensitive areas, etc. In addition to this, the project influence area (10 km buffer from the center line on either sides) for impact assessment is also considered in those areas that are directly or indirectly influenced by the project activities during construction or operation of the proposed road work such as Hot Mix plants, sand quarries, source of raw material and material transport, etc.

Task 4: Assessment of Baseline Environmental and Social Conditions

This task comprises a collection of baseline data for the project road locations primarily on physical, biological and socio-economic conditions. The secondary source[2] of information was utilised for giving a generic snapshot of socio environment features. In addition, existing environmental and social quality/features along the project roads were assessed based on a walk through surveys, public consultations, FGD's and discussions with line department officials.

Task 5: Public Consultations/ Focus Group Discussions

To cover a wide range of stakeholders in the study area, corner meetings were conducted at selected places with women groups, men and road users to understand the people's perception about the project as well as their issues and concerns. Overall project features, social safeguards, issues related to women's safety and security, environmental safeguards, and enhancement measures would be implemented in the project was also discussed with the public.

Task 6: Prediction of Environmental and Social Impacts

The task identified likely impacts that would arise due to the construction of project roads, through changes in the physical, biological or socio-economic environment. The assessment considered both positive and negative impacts at different stages of implementation, i.e. pre-construction, construction and operation stages of the project roads.

Task 7: Preparation of Environment and Social Management Plan (ESMP)

A comprehensive Environmental and Social Management Plan (ESMP) was prepared which included mitigation measures for all the negative impacts of sub-projects and enhancement measures for positive impacts.

Task 8: Preparation of Resettlement Action Plan (RAP)

Based on the impacts a suitable RAP[3] shall be prepared to specify the procedures it will follow and the actions it will take to properly resettle/compensate affected people and

[2] Secondary source of information for various socio-economic parameters were collected from government departments like Census of India, Department of Industries, Department of Economics and Statistics, Department of Agriculture, Directorate of Settlements and Land Records etc. This helped to understand the socio-economic profile of the project area with respect to indicators like population growth rate, literacy rate, work force participation rate (WFPR) etc. in comparison with the project districts and Tamil Nadu state

[3] Out of the seven roads the preliminary alignment has already been done for 4 roads and the technical consultant will review the alignment and finalise in consultation with TNRSP field implementation units at the earliest. The social team will arrange public consultation to disseminate the project alignment and entitlement matrix, also will conduct 100% census and socio

communities. The objective of the RAP is to assist the affected people in their efforts to improve their living standards or at least regain their living standards to their pre-displacement levels.

Task 7: Preparation of Environmental and Social Management Budget

Based on the impact assessment for the environmental and social components a suitable budget has been estimated to compensate for the temporary and permanent impacts that are likely during the project implementation. As part of the project implementation monitoring, budgetary provision has been allotted for RAP implementation and environmental monitoring. The budget also includes compensatory afforestation measures for the loss of avenue trees due to road widening.

Task 8: Environmental Safeguard Clauses in the Bid Document

Suitable safeguard clauses have been prepared based on the ESIA, the prepared clauses shall form part of the bid document either in the General condition or Specific conditions of the contract agreement/ bid document. The prepared ESMP shall also be part of the bid document.

4 Regulatory Requirements

4.1 World Bank safeguard/ Operational policies

The World Bank policies and directives on environmental and social safeguards have adhered to the project roads. The applicability of the relevant policies of the project roads that are undergoing up-gradation (strengthening and widening) are summarized in the following table

Table 4: Applicable World Bank Operational policies

OP 4.01 Environmental Assessment	Help to ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process
OP 4.04 Natural Habitats	Promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.
OP 4.36 Forestry	Aims to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively for sustainable economic development and protect vital local and global environmental services and values of forests
OP 4.12 Involuntary Resettlement	Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher.
OP 4.10 Indigenous People	Design and implement projects in a way that fosters full respect for indigenous peoples' dignity, human rights, and cultural uniqueness so that they i. Receive culturally compatible social and economic benefits, and ii. Do not suffer adverse effects during the development process.
OP 4.11	Assist in preserving PCR and in avoiding their destruction or damage. PCR

economic for significantly affected households. Based on the census the Resettlement Action Plan shall be developed. RAP for 3 roads shall be ready by end of February 2020 for remaining 4 roads, RAP shall be ready by end of June 2020.

Physical Cultural Resources (PCR)	includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.

4.2 Environmental Rules and Regulations

To understand the extent of the environmental and social assessment for the proposed improvement works, applicable laws, legislation, and policies have been reviewed. A summary of environmental legislation/regulations relevant to project roads is furnished in the following table.

Table 5: Applicable Acts, Rules and Regulation

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
Notification on use of fly ash (subsequent amendments)	2003 2009 2016	To mandate reuse of large quantities of fly ash from thermal power plants for development projects within a 300km radius.	MoEF&CC	Yes, except Arcot to Arani (SH 4), all other project roads should use flyash due to the presence of Thermal power plants within a 100km radius. *Mettur Thermal Power plant* is the nearest (within 100km) for SH-222, SH – 30 SH -15 and MDR 108. *Nagai Power plant* is nearest for SH-139 and *Ennore Thermal power plant* is nearest to SH 116
Wildlife Protection Act (subsequent amendments)	1972 2002	To protect wild animals and birds through the creation of National Parks / Sanctuaries and it also provides more stringent sections detailing punishments, includes the penalty for offenses under the Act.	MoEF&CC (Wildlife Division)	Yes, one of the project road MDR 108 (Erode to Chennimalai) traverses through Vellode, where the Vellode bird sanctuary is located within a 2 km radius and hence this act is applicable.
Forest (Conservation) Act	1980	To protect and manage forests, to check deforestation by restricting the conversion of forest areas into non-forest areas	Forest department, GoTN/ MoEF&CC	Yes, one of the project road SH 30 (Malliyakarai to Attur) falls under the influence of the reserved forest in Malliyakarai and hence this act is applicable
Biological Diversity Act	2002	Disclosure of species survey or collection activities to the National Biodiversity Authority	MoEF&CC	Yes, applicable for project roads SH 30 and MDR 108.
Water (Prevention and	1974	To provide for the prevention and control	CPCB/ TNPCB	Yes, as per the Environmental

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
Control of Pollution) Act (and subsequent amendments)		of water pollution and the maintaining or restoring of wholesomeness of water.		Protection Act 1986
Air (Prevention and Control of Pollution) Act (and subsequent amendments)	1981	To provide for the prevention, control, and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	CPCB/ TNPCB	Yes, as per the Environmental Protection Act 1986
Noise Pollution (Regulation and Control) rules	2000	Noise pollution regulation and controls	CPCB/ TNPCB	Yes, as per the Environmental Protection Act 1986
Hazardous Waste (Management& Transboundary Movement) Rules and subsequent amendments	2008 2016 2019	Storage, handling, transportation, and disposal of hazardous waste	TNPCB	Yes, storage and handling of Hazardous waste during construction
The municipal solid waste management rules and subsequent amendments	2000 2016	Management and handling of solid waste	TNPCB, and concern ULB's/ corporation	Yes, for disposal of solid waste generated during construction
Environmental Clearance (EC) under EIA notification (and subsequent amendments) for new Quarry areas	2006	For new quarry operations	SEIAA, TNPCB	Yes, for new quarry operations it is mandatory to obtain EC from the SEIAA
Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989	To control vehicular air and noise pollution. To regulate the development of the transport sector, check and control vehicular air and noise pollution.	Transportation Department, GoTN	Yes, for all the vehicles used for construction purposes
The Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act	2010	To amend the Ancient Monuments and Archaeological Sites and Remains Act, 1958, including a declaration of regulated and prohibited areas around the monuments.	Department of Archaeology, GoTN, National Monuments authority	Yes, in case of chance-find
The Right to Fair	2013	set out rules for fair compensation and	The revenue department,	Yes, this will be applicable as there

Policy/ Acts/Rules	Year	Purpose	Responsible Institution	Applicability (Yes/ No)
Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013 (Act 30 of 2013) (LARR)		acquisition of land	GoTN	will be a land acquisition for widening, geometric improvements, and realignment
The Tamil Nadu Protection of Tanks and Eviction of Encroachment Act, 2007	2007	An Act to provide measures for checking the encroachment, eviction of encroachment in tanks which are under the control and management of the Public Works Department, protection of such tanks and for matters incidental thereto.	Water Resource Department (WRD), PWD	Yes, it will be applicable for the widening of roads near the water bodies
Tamil Nadu Highways Act, (TNHA)	2001	An Act to provide for the declaration of certain highways to be State highways, restriction of ribbon development along such highways, prevention and removal of encroachment thereon, construction, maintenance and development of highways, and levy of betterment charges and for matters connected therewith or incidental thereto	Tamil Nadu Highways Department, GoTN	Yes, this will be applicable as there will be a land acquisition for widening, geometric improvements, and realignment

Source: CPCB, MoEF&CC, TNPCB, and TNRSP

4.2.1 Resettlement Policy Framework (RPF)

Resettlement Policy Framework (RPF) consisting of national/state policies and the World Bank's operational policy on involuntary resettlement is being implemented in TNRSP-II. The frameworks provide an overview of screening of the road-projects for social impacts, the process for social impact assessment, preparation of land plan schedules, entitlements for different impact categories, institutional arrangements, information disclosure and consultations and the preparation and implementation of Resettlement Plan (RP). Land will be acquired following provisions of Tamil Nadu Highway Act, 2001 (to be amended to incorporate the provisions of RFCTLARR Act, 2013) and while determining the compensation for land, the competent authority will be guided by the provisions of Sec 26, Sec 27, Sec 28, Sec 29 and Sec 30 of RFCTLARR Act, 2013. The replacement value of

houses, buildings and other immovable properties will be determined based on the latest PWD Standard Schedule of Rates (SSR) as on date without depreciation. Compensation for trees will be based on their market value. Disputes relating to ownership rights, apportionment issues, amount of compensation awarded will be referred by the Special DRO to the jurisdictional LARR Authority, to be constituted following Section 51(1) of the RFCTLARR Act, 2013.

4.2.2 Environmental Management Framework (EMF)

The Environmental Management Plan (EMF) for the project defines the EA process to be followed, complying with the in-country environmental legislations as well as Bank's environmental safeguards policies. The EMF defines the four key process steps to be followed for corridor level EAs with relevant illustrations. These include: (i) Environmental Screening and Scoping; (ii) Environmental Assessment; (iii) Environmental and Social Management Plan; and (iv) integration of ESMPs into actionable mechanisms including road construction contracts. The EMF also defines the public consultations which shall form part of the process steps (i) to (iii), cumulative impact assessment requirements and the institutional management framework.

4.3 Environmental Regulatory Clearance Requirements

As per the Wildlife Protection Act 1972, the proposed project interventions at MDR 108 mandates environmental clearance from National Board for Wildlife (NBWL), this is because due to the presence of the Vellode Bird Sanctuary[4] within the influence area (less than 2 km). The clearance shall be obtained by the project proponent (TNRSP) from the NBWL. For the loss of water bodies, due to the widening of the project roads, NoC/ permission from the competent authority (Water Resource Department, PWG, GoTN) is required, which shall be obtained by the project proponent (TNRSP) from the WRD. For all other project roads, the requirement for Environmental Clearance (EC) from the state or central level is not envisaged.

However, construction stage clearances are required for all the project roads. The clearance requirements to comply are listed in the table below. As part of the corridor level ESMPs, these requirements have been adequately integrated into the construction contract documents.

Table 6: Environmental Clearance/ NoC/Permission for the Contractor

Sl.no	Clearances	Acts	Approving Agency	Time Frame	Responsibility	
					Execution	Supervision
1.	Consent to Establish and Operate Hot mix plant, Crushers, Batching Plant and Labour Camps	Water (Prevention and Control of Pollution) Act 1974 Air (Prevention and Control of Pollution) Act. 1981	Tamil Nadu Pollution Control Board	3 months	Contractor	PIU/ Supervision Consultant
2.	Permission for removal of avenue tree	Forest (Conservation) Act, 1980 and	Revenue Divisional Officer	3 - 6 months	Contractor (assisted by the Forest	PIU/ Supervision Consultant

[4] Sanctuary was declared under Section 26(1) of Wildlife Protection Act 1972 (Central Act 53 of 1972) in Government Order (Ms.) No.44, Environment and Forests (FR-V) Department, dated 29.2.2000

Sl.no	Clearances	Acts	Approving Agency	Time Frame	Responsibility	
					Execution	Supervision
	within the	amendments and rules therein			Dept., GoTN)	
3.	Authorisation for Disposal of Hazardous Wastes	Hazardous Wastes (Management, Handling, and Transboundary Movement) Rules, 2016.	Tamil Nadu Pollution Control Board	2 months	Contractor	PIU/ Supervision Consultant
4.	Permission for Sand Mining from River bed	Mines and Minerals (Development and Regulation) Act, 1957 Environmental (Protection) Act 1986 Water (P& CP) Act 1974 and Air (P& CP) Act 1981	Commissioner of Geology and Mining, GoTN Environmental Clearance from SEIAA, Go TN CTE/CTO from TNPCB	2 months	Contractor	PIU/ Supervision Consultant
5.	Permission for Opening of New Quarry	Mines and Minerals (Development and Regulation) Act, 1957 Environmental (Protection) Act 1986 Water (P& CP) Act 1974 and Air (P& CP) Act 1981	Commissioner of Geology and Mining, GoTN Environmental Clearance from SEIAA, Go TN CTE/CTO from TNPCB	2 – 6 months	Contractor	PIU/ Supervision Consultant
6.	Storage of Hazardous Chemicals (Fuel Oils) and Explosives	Manufacturing Storage and Import of Hazardous Chemicals Rules 1989	Chief Controller of Explosive, Chennai	3 months	Contractor	PIU/ Supervision Consultant
7.	Permission for Withdrawal of Ground Water	Environmental (Protection) Act, 1986	Central/State Ground Water Board	3 months	Contractor	PIU/ Supervision Consultant
8.	Pollution Under Control Certificate	Central Motor Vehicles Act 1988	Transport Department (GoTN)	1 Month	Contractor	PIU/ Supervision Consultant
9.	Employing Labour	The Building And Other Construction Workers. (Regulation of Employment and Conditions of Service) Act, 1996	Labour & Employment Dept., GoTN	1 Week	Contractor	PIU/ Supervision Consultant
10.	Registration of Workers	Labour Welfare Acts.	Labour & Employment Dept., GoTN	1 Month	Contractor	PIU/ Supervision Consultant

Source: CPCB and MoEF&CC

5 Description of the Environment

5.1 Physical Environment

The project roads are scattered across the state of Tamil Nadu and are falling under the six districts namely Salem, Erode, Kanchipuram, Ariyalur, Tiruvannamalai, and Ranipet. For the preparation of this ESIA summary, the environmental features observed from the five districts have been compiled and narrated.

5.1.1 Topography

The topography of the district for which the project roads are located has been taken for discussion

Project Roads	Project District	Topography details
SH 222 (Omalur to Mecheri) and SH 30 (Malliyakarai to Attur)	Salem	Topography reveals hill ranges, hillocks and undulating terrain with a gentle slope towards east
SH 15 (Chitode to Erode) and MDR 108 (Erode to Chennimalai)	Erode	Being a neighboring district to Salem, the topography remains similar, with the hilly area, upland area and plains with a moderate slope toward east
SH 116 (Kanchipuram to Cheyyar)	Kanchipuram	The topography is characterised by an undulating topography with innumerable depressions, which are used as irrigation tanks
	Tiruvannamalai	Topography has undulating terrain with isolated hillocks on the western and northwestern parts
SH 139 (Ariyalur to Reddipalayam)	Ariyalur	The topography has undulating terrain, characterized by low mounds and broad valleys.
SH 4 (Arcot to Arani)	Ranipet	Topography varies concerning the direction, the southern direction has hilly terrain undulating to rugged, flanked by hill ranges belonging to the Eastern Ghats and in the eastern direction, it has gently undulating plain dotted with isolated hillocks with sharply rising peaks, sloping towards east.

Source: CGWB

5.1.2 Climate and Temperature

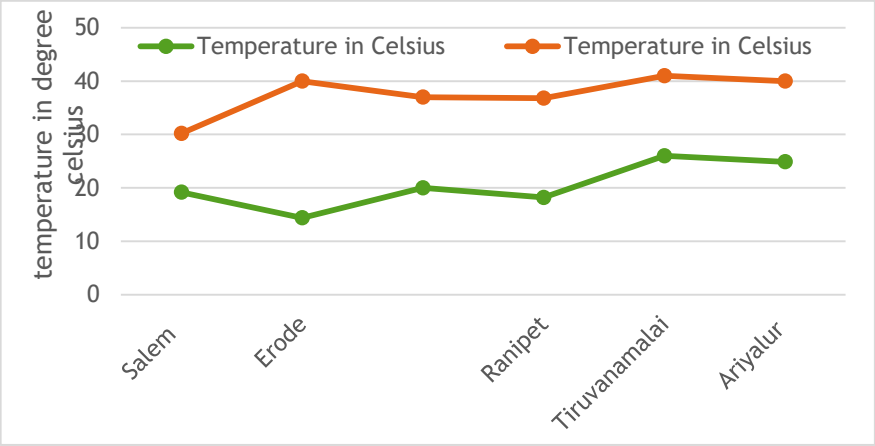


Figure 9: Annual Average Temperature

The typical tropical climate is observed in Salem district, the hot weather begins early in March, the highest temperature is observed in April and May. The weather cools down progressively from about mid of June and by December. Erode district has a salubrious climate because of the hilly region, whereas the central and eastern parts of the district are hot and humid. Tiruvannamalai district falls under the tropical climate, the average temperature varies from 26°C to 41°C. The recorded humidity is around 80%. The wind speed ranges from 7.4 to 12.6 km/hr. Ariyalur district has a typical semi-arid climate with hot summers and moderately cool winters. The hottest season is from March to May. The wind speed during June to August is more than 25 km/hr. Ranipet district has a tropical climate. The highest temperature is recorded during May and June. The relative humidity ranges from 37% to 85 %. Kanchipuram district experiences hot and humid climatic conditions. Out of all project districts, the highest humidity (83 to 84%) was recorded at Kanchipuram for June. The highest temperature of 40°C (annual average) was recorded at Erode and Ariyalur districts and the minimum temperature of 14.4°C was recorded at Erode.

5.1.3 Rainfall

The annual rainfall over the Salem district is 997.9 mm. The highest rainfall was recorded at Yercaud (1594.3 mm). Rainfall projection up to the year 2080 shows a decrease rainfall trend for Salem district to about 7%. For the Erode district, the annual rainfall is 702.9 mm. similar to Salem district the projected rainfall trend shows a decrease of 7% by the year 2080. In Kanchipuram, the annual average rainfall is 1227.7 mm, the highest rainfall was recorded at Kovalam (1214.2 mm). The projected rainfall trend for the district is decreased by 1% by the year 2080. In Ranipet, the annual average rainfall is 936.2mm, the contribution of southwest monsoon ranges from 45% to 52 %. The projected rainfall trend for Ranipet district shows a decreased trend by 5% in the year 2080. In Ariyalur District, the annual average rainfall is 1071.8mm, based on the projected rainfall, it is observed that nearly a 3% decrease in the rainfall by 2080. In the Tiruvannamalai district, the annual average rainfall is 1040 mm. the projected rainfall trend for the year 2080, shows a decrease in rainfall by 4%.

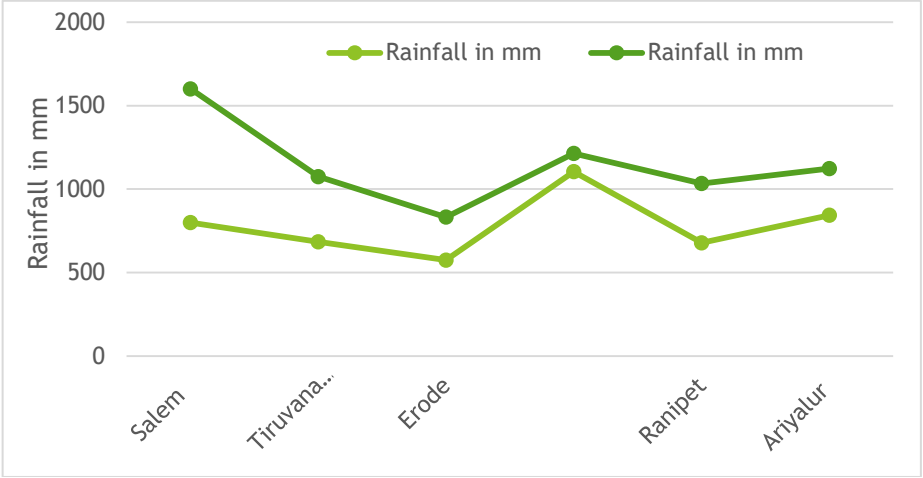


Figure 10: Annual Average Rainfall

District	Average Annual Rainfall in mm												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Salem	8.5	7.5	16.0	54	100.8	65.1	96.4	119.6	159.5	190.9	123.8	55.8	997.9
Erode	6.6	9.5	16.8	44.5	81.1	27.5	38.9	57.6	105.8	158.9	110.5	45.2	702.9
Kanchipuram	17.3	11.8	3.3	16.4	46.3	68.4	109.5	164.1	148.8	225.8	283.0	133.0	1227.7

Ranipet	8.1	6.8	9.2	22.3	75.0	65.9	107.3	129	163.9	163.2	127.2	58.3	936.2
Tiruvanamalai	14.7	11.8	11.4	19.3	68.2	62.4	96.0	142.3	167.4	194.2	170.2	82.1	1040.0
Ariyalur	21.2	11.3	13.1	21.9	66.8	51.5	72.7	129.2	138.6	193.4	205.2	146.9	1071.8

Source: data.gov.in

5.1.4 Seismicity

In general, the southern part of India has experienced very less seismic activity in comparison with the North. The project roads coming under the Erode District (SH 15, MDR 108) and Ariyalur District (SH 139) are categorised under Zone II (Low Damage Risk Zone). The project roads coming under Kanchipuram and Tiruvannamalai Districts (SH 116), Salem District (SH 222 and SH30) and Ranipet District (SH 4) are categorised under Zone III

(Moderate Damage Risk Zone). Given this, the project components including the structures (bridges, culverts) will be constructed to withstand the level of seismic activity as per ISI specifications for Zone-II and III.

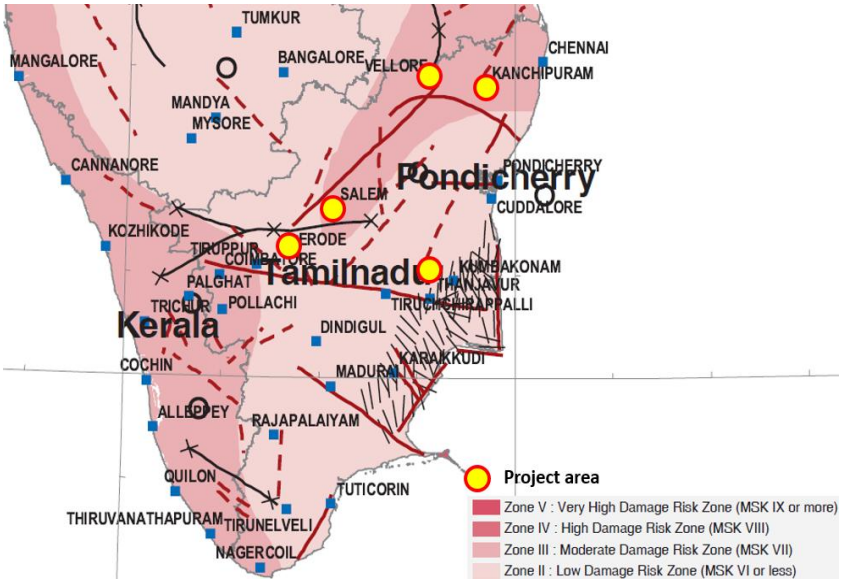


Figure 11: Earthquake Hazard Map

5.1.5 Ambient Air Quality

Under the National Air Quality Monitoring Programme (NAQMP), none of the project area locations are available and hence, secondary information on the ambient air quality is not available. To fill the gap, primary environmental monitoring has been conducted for the sensitive/ settlement locations along the project corridors. The outcome of the analysis has been shared in the following table. From the observation, it is evident that the AAQ quality in the project area is in good condition. The recorded values against the parameters are less in concentration when compared with the stipulated AAQ standard.

Table 7: Ambient Air Quality in the Project Corridors

Sl.no	Project Corridors	Monitoring locations/ stations	Sulphur Dioxide	Nitrogen Dioxide	Particulate Matter (10 µm)	Particulate Matter (2.5 µm)
			µg/m³	µg/m³	µg/m³	µg/m³
1	SH 222 (Omalur to Mecheri Road)	Pachanampatti Village	12.86	22.76	57.39	27.48
		Mecheri village	14.56	24.28	53.65	25.1
		Sadhapadi Village	**15.38**	**25.5**	49.16	22.7
2	SH 30 (Malliyakarai to Attur Road)	Eachampatti Village	13.45	24.1	**57.62**	**28.11**
		Attur- Top of SKN Lodge	12.41	22.39	54.1	25.76

Sl.no	Project Corridors	Monitoring locations/ stations	Sulphur Dioxide	Nitrogen Dioxide	Particulate Matter (10 µm)	Particulate Matter (2.5 µm)
			µg/m³	µg/m³	µg/m³	µg/m³
3	SH 15 (Chithode to Erode Road)	Chithode Village	10.45	18.47	46.82	**17.63**
		Erode- Commercial Area	10.74	20.35	47.58	19.63
4	SH 116 (Kanchipuram to Cheyyar Road)	Near Sevlimedu	13.84	22.57	50.35	20.77
		Dusi Village	10.57	20.46	47.18	20.33
		Cheyyar Sipcot	11.52	21.28	45.94	24.17
5	MDR 108 (Erode to Chennimalai Road)	Near Kaundachipalayam -Residential Area	12.51	22.69	44.1	22.73
		Near Erode Railway Station Commercial Area	13.28	23.62	51.37	24.62
		Near Vellode Higher Sec School	12.55	24.31	52.76	21.1
		Near Arthanari Palayam Village	13.67	23.51	53.29	22.67
6	Ariyalur to Reddipalayam	Anna Nagar	14.39	25.17	53.6	24.53
		Kalambur	9.53	**18.28**	43.12	19.74
7	Arcot to Arani	Arcot	**8.96**	19.34	**42.65**	20.18
		Timiri	10.52	20.87	46.45	22.63
		Erumbedu	11.49	22.68	49.72	20.34
	NAAQ Standards : 2009		**80 (24 hours)**	**80 (24 hours)**	**100 (24 hours)**	**60 (24 hours)**

Source: primary Environmental Monitoring, 2020

5.1.6 Noise Levels

Ambient noise levels have been monitored using the sound level meter for all the project corridors. The noise-sensitive receptor locations have been selected based on the road inventory and 24 hour sampling were conducted. The outcome of the analysis shows a significant increase in the sound levels near the sensitive receptors, this may be due to the movement of vehicles in the project corridor, where the receptors are located nearby.

Table 8: Ambient Noise Levels in the Project Corridors

Sl.no	Project Corridors	Sampling Locations	Area classification	Noise Levels in dB (A)	
				Day Time	Night Time
1	Omalur to Mecheri	Sri Balamurugan College	Sensitive area	61.6	52.8
		Chinnasathanpadi	Residential area	62.2	51.5
		Raja manickam Hospital	Sensitive area	59.3	54.7
		South Indian School	Sensitive area	60.8	54.4
		Paalikadai School	Sensitive area	73.6	62.9
		Nalam Hospital	Sensitive area	67.5	55.1
		Paali kadai Primary Health center	Sensitive area	62.9	52.3
2	Malliyakarai to Attur	Rasi matric higher secondary school	Sensitive area	66.6	58.4
		Panchayat union public school Echampatti	Sensitive area	61.5	52.3
		Thandavarayapuram village Agricultural office	Commercial area	64.3	58.1
		Thandavarayapuram first Aid medical center	Sensitive area	67.9	60.6
		Attur police station	Commercial area	72.1	65.7
3	Chithode to	Chithode Govt school	Sensitive area	62.8	55.6

Sl.no	Project Corridors	Sampling Locations	Area classification	Noise Levels in dB (A)	
				Day Time	Night Time
	Erode	Tamilnadu ITI	Sensitive area	65.5	57.2
		Erode Hindu kalvi nilayam	Sensitive area	60.2	54.9
		CN College Veerapanchathiram	Sensitive area	63.1	56
		Thanthai Periyar Hospital	Sensitive area	64	56.2
4	Kanchipuram to Cheyyar	Kanchipuram Govt High school sevlimedu	Sensitive area	64.1	52.7
		Sangford school Abdullapuram	Sensitive area	60.6	52.4
		Government high school mamandur	Sensitive area	65.9	53.5
		Cheyyar Sipcot	Industrial area	59.3	48.1
5	Erode to Chennimalai	Near Erode Railway Station	Commercial area	64.8	55.6
		Near Joseph Hospital	Sensitive area	62.4	54.5
		Erode Arts and Science	Sensitive area	65.3	57.7
		Near Govt school	Sensitive area	63.2	55.1
		Shoba College of nursing	Sensitive area	62.1	54.9
		Kongu Vellalar school	Sensitive area	63.6	54.8
		Arthinari Palayam	Residential area	60.7	51.1
6	Ariyalur to Reddipalayam	Primary school Ayyampettai	Sensitive area	63.9	55.1
		Public school Kasthambady	Sensitive area	62.4	53.2
7	Arcot to Arani	Arcot Sri Mahalakshmi Womens's College	Sensitive area	60.3	50.8
		Timiri Govt Boy's Higher sec school	Sensitive area	63.2	52.5
		Sri Balaji Chokalingam Engg College	Sensitive area	60.1	49.6
CPCB Norms		**Industrial Area**		**75**	**70**
		Commercial Area		**65**	**55**
		Residential Area		**55**	**45**
		Silence Zone		**50**	**40**

Source: primary Environmental Monitoring, 2020

5.1.7 Soil

As per the CGWB information on soil characteristics, the soil in Salem district has been classified into 6 major soil types namely Red insitu, Red Colluvial Soil, Black Soil, Brown Soil, Alluvial and Mixed Soil. A major part of the district is covered by Red insitu and Red Colluvial soils. Similarly Erode district also has 6 major types of soils namely Red calcareous soil, Red non-calcareous soil, Black Soil, Alluvial and Colluvial soils, Brown soil and Forest soil. A major part of the Erode district is covered by red calcareous soil. In the Tiruvannamalai district, red loamy soil is predominantly found here. Other types of soils include ferruginous loamy and sandy loamy. Ariyalur District has 30% Black soil and 70% Alluvial Soil. Ranipet District is dominated by the red loamy soil, which is followed by black cotton soil. In Kanchipuram District, the soil has been classified into 4 type's namely clayey soil, red sandy or red loamy soil, Red sandy brown clayey soil, and Alluvial soil. Red sandy brown clayey soil is the most predominant, covering more than 71% of the district.

The soil samples along the project corridors has been collected and analysed for its quality. The outcome of the analysis shows, percent of sand is very high in Erode to Chennimalai (MDR 108) road, it is recorded nearly 82.9%, followed by Kanchipuram to Cheyyar (SH 116), which was 81.8%. Alkaline pH has been observed across all the soil samples. EC was in the range between 34.8 µS/cm to 125.8 µS/cm, high EC was recorded at Erode to Chennimalai (MDR 108) road and lowest was at Kanchipuram to Cheyyar (SH 116). Good moisture content of 13.4% was recorded in Malliyakarai to Attur Road (SH 30). Soil in Omalur to Mecheri road (SH 222) has 30.6% water holding capacity. The key

minerals like potassium, phosphate and sodium are recorded high at Erode to Chennimalai Road (MDR 108) and Chithode to Erode Road (SH 15). The presence of nitrate is high in Omalur to Mecheri Road (SH 222) and Malliyakarai to Attur Road (SH 30).

Table 9: Soil Quality in the Project Corridors

Soil Parameters	Project Corridors						
	Omalur to Mecheri	Malliyakarai to Attur	Chithode to Erode	Kanchipuram to Cheyyar	Erode to Chennimalai	Ariyalur to Reddipalayam	Arcot to Arani
Soil Texture	Sandy Loam	Loamy sand	Loamy sand	Loamy sand	Sandy Loam	Sandy Loam	Sandy Loam
i)Sand	59.8	65.1	62.4	81.8	82.9	72.4	73.4
ii)Silt	38.0	32.4	27.4	13.4	12.1	24.0	23.5
iii)Clay	2.2	2.5	10.1	4.8	4.8	3.6	3.1
pH (at 25˚C) @ 10% Solution	9.2	9.1	8.7	8.0	9.0	8.0	8.3
Electrical Conductivity (at 25˚C)	47.9	54.3	119.2	34.8	125.8	125.3	120.8
Cation exchange capacity	8.0	11.6	9.3	4.4	16.3	7.8	7.7
Moisture Content	7.3	13.4	7.7	7.0	7.7	5.0	9.2
Water holding capacity	30.6	17.7	19.5	19.8	24.4	28.2	22.3
Salinity	1.4	1.1	1.8	0.6	1.1	0.7	1.4
Particle Size Distribution	Passed through 850 micron						
Potassium	26.0	20.6	2131.8	503.4	4993.1	146.1	170.9
Phosphate	37.3	178.7	20.3	56.3	52.4	109.1	114.6
Sodium	371.9	294.7	198.2	95.9	215.1	194.8	107.1
Porosity	30.0	17.7	19.5	19.4	23.9	27.5	22.5
Sodium Absorption Ratio	2.9	1.8	2.3	1.1	2.9	3.2	1.3
Nitrate as NO_3	1076.9	1510.6	5.2	10.6	9.7	26.8	29.2
Organic Content	0.8	1.0	2.0	1.5	1.4	2.4	1.7

Source: primary Environmental Monitoring, 2020

5.1.8 Hydrogeology

Salem district is underlain entirely by Archaean Crystalline formations with recent alluvial and Colluvial deposits. The depth to water level varied between 0.10 – 11.46 m bgl during pre-monsoon and 0.10 – 17.15 m bgl during post-monsoon. Erode district is underlain entirely by Archaean Crystalline formations with recent alluvial deposits occurring along the river and streams courses and colluvium of valley-fills. The depth to water level varied between 1.76 and 35.69 m bgl during pre-monsoon and 1.53 and 16.40 m bgl during post-monsoon. The aquifer systems in the Ariyalur district is constituted by Basal crystalline rocks and Sedimentary rocks. The depth to water level during pre-monsoon ranges from 1.10 to 8.55 m bgl and in post-monsoon it ranges from 1.10 to 6.78 m bgl.

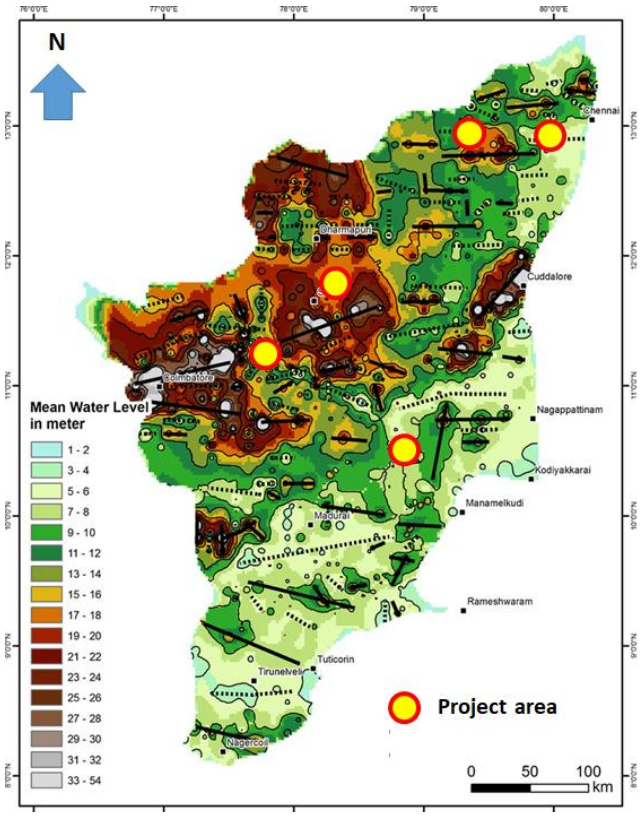


Figure 12: Groundwater Level Map

Tiruvannamalai district is underlined by Hard Rock. Well, yield in lpm ranges between 30 to 250. The depth of the water level is from 3m to 22m. Ranipet district is underlain by geological formations ranging in age from Archaean to Recent. In the pre-monsoon the water level varies from 1.15 – 18.60 m bgl and in the post-monsoon it various from 1 to 18.45 m bgl. In Kanchipuram district underlain by both sedimentary and fissured formations. The depth to water level varies from 3.50 – 8.34 m bgl during pre-monsoon and 1.32 – 7.53 m bgl during post-monsoon. The groundwater development status in the project districts is given in the following table. Salem and Ranipet districts should have more rainwater recharging system to replenish the groundwater, which should be followed by Ranipet and Erode.

Groundwater Potential (as per CGWB)	Salem	Erode	Kanchi-puram	Ariyalur	Thiruvana-malai	Ranipet
Net Groundwater Availability (In MCM)	523.56	696.03	1055.25	314.97	1093.34	592.8
Existing Gross Groundwater Draft For All Users (In MCM)	856.32	651.68	694.19	161.52	924.37	621.44
Stage Of Groundwater Development (In %)	1.64	0.94	0.66	0.51	0.85	1.05
Categorization Of District	Over Exploited	Critical	Safe	Safe	Semi Critical	Over Exploited

Source: CGWB

5.1.9 Surface water Quality

As indicated in the project inventory section 2.1, most of the surface water bodies observed along the project corridors remains seasonal. To generate the primary information on the water quality, surface water samples has been collected and analysed for key physicochemical properties. In Malliyakarai to Attur (SH 30) Road, the surface

water bodies are completely dried and hence surface water samples are not collected. The following table gives the average values across the project corridors. Detailed analysis and results will be included in the corridor specific ESIA.

Table 10: Surface Water Quality in the Project Corridors

Sl. no	Water Quality Parameters	Omalur to Mecheri (SH 222)	Chithode to Erode (SH 15)	Kanchipuram to Cheyyar (SH 116)	Erode to Chennimalai (MDR 108)	Ariyalur to Reddipalayam (SH 139)	Arcot to Arani (SH 4)	Limits as per IS 2296: 1982
1	pH (at 25°C)	8.0	8.3	8.0	7.6	7.4	7.3	6.5 to 8.5
2	Colour	BDL	BDL	BDL	BDL	BDL	BDL	300
3	Calcium as Ca (mg/l)	31.1	56.1	30.1	25.6	69.3	44.1	75.0
4	Chloride as Cl (mg/l)	72.3	93.1	51.4	28.1	143.4	174.9	600.0
5	Total Dissolved Solids (mg/l)	336.0	507.0	298.5	186.7	673.0	527.3	1500.0
6	Sulphate as SO_4 (mg/l)	45.7	74.0	22.8	13.5	38.6	51.5	200.0
7	Fluoride (mg/l)	0.3	0.3	0.3	BDL	0.3	BDL	1.5
8	Iron as Fe (mg/l)	0.6	0.0	0.3	0.3	0.3	0.5	50.0
9	BOD,3 days 27°C as O_2 (mg/l)	6.0	9.0	4.5	3.7	5.5	8.0	3.0
10	Oil and Grease (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	0.1
11	Dissolved Oxygen (mg/l)	6.0	5.9	6.1	6.0	5.6	5.8	4.0

Source: primary Environmental Monitoring, 2020

From the analysis, the pH remains alkaline across all the water samples and ranges between 7.3 to 8.3. The calcium concentration remains high for the water sample collected at Ariyalur to Reddipalayam (SH 139), however in comparison with the surface water quality standard IS:2296, it is well below the stipulated limit. Other parameters including Chloride, TDS, Sulphate, Fluoride and Iron concentration are well within the IS:2296 stipulated limits. However, the BOD and DO were observed to be high, which indicates the presence of the organic pollution, the sources may be discharge of sewage water into the water body or through some anthropogenic activities (cleaning of domestic animals, surface runoff from the nearby agriculture field, algal bloom due to the use of fertilisers etc.,).

5.1.10 Groundwater Quality

Groundwater quality in the project area has been assessed through collection of water samples from the representative wells/ bore wells and hand pumps. The key purpose is to check the suitability of the water for potable and domestic purpose for the use of labours. Other requirements includes to check the pollution level in the water and to set the information as a base and to record the water quality during the construction period to check the impacts. The outcome of the analysis is given in the following table.

Table 11: Groundwater Quality in the Project Corridors

Groundwater Quality Parameters	Omalur to Mecheri (SH 222)	Malliyakarai to Attur (SH 30)	Chithode to Erode (SH 15)	Kanchipuram to Cheyyar (SH 116)	Erode to Chennimalai (MDR 108)	Ariyalur to Reddipalayam (SH 139)	Arcot to Arani (SH 4)	Permissible Limits
pH (at 25 °C)	8.0	8.0	8.3	7.6	8.2	7.7	7.2	6.5-8.5
Colour (Hazen Unit)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	15
Turbidity NTU	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5
Total	513	533	195	518	410	550	**618**	600

Hardness as $CaCO_3$ (mg/l)								
Calcium as Ca (mg/l)	95	114	48	114	86	158	157	200
Total Alkalinity as $CaCO_3$ (mg/l)	517	246	213	307	340	535	**647**	600
Chloride as Cl (mg/l)	225	233	64	225	131	196	343	1000
Residual free Chlorine (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1
Magnesium as Mg (mg/l)	67.2	60.3	18.2	56.7	47.8	37.7	49.0	100
Total Dissolved Solids (mg/l)	1103.3	811.0	367.5	830.0	678.7	988.0	1236.3	2000
Sulphate as SO_4 (mg/l)	239.0	104.6	45.7	95.9	63.0	118.4	129.9	400
Fluoride (mg/l)	0.4	0.3	0.3	0.4	0.4	0.4	0.4	1.5
Nitrate as NO_3 (mg/l)	26.5	20.8	5.8	9.8	14.6	7.2	3.6	45
Iron as Fe (mg/l)	0.03	0.03	0.02	0.01	0.12	0.06	0.06	0.3

Source: primary Environmental Monitoring, 2020

The pH of the groundwater is in alkaline and ranges between 7.2 to 8.3. The recorded Total hardness and Total Alkalinity concentration are high for the water samples collected from Arcot to Arani road (SH 4) in comparison with the IS:10500 (drinking water standard). Other water quality parameters are well within the limits. With prior water treatment, the groundwater in Arcot to Arani road (SH 4) can be used for potable and domestic purposes. For other locations, the groundwater quality remains good for potable and domestic purposes.

5.1.11 Surface Drainage

(i) **Omalur-Mecheri Road (SH 222)** does not have major drain crossing (including stream/ river). The earthen drain is present along the project road, at some locations (especially at built-up sections) RCC drains are provided. The location of the RCC drains is given in the following table. However, there are no dedicated drain facilities near the water bodies (a pond is located at km 7/800).

Sl No	Existing km		Drain	Side
	From	To		
1	0/130	0/255	RCC	LHS
2	1/000	1/150	RCC	RHS
3	3/572	3/699	RCC	Both Sides
4	3/699	3/921	RCC	LHS
5	3/921	4/145	RCC	Both Sides
6	5/900	5/968	RCC	RHS
7	8/210	8/515	RCC	RHS
8	14/500	14/600	RCC	Both Sides

Source: Road Inventory, 2019

Box Culvert at Km 3/700

Cut Stone Slab Culvert at Km 6/900

(ii) **Malliyakarai – Attur Road (SH 30)** is having 2 minor bridges and a causeway located at km 82/447 (Minor Bridge), km 86/430 (Minor Bridge (Crossing Kombai River)) and km 89/525 (Causeway (Vented Causeway).

Minor Bridge at km 82/447

Minor Bridge at km 86/430

The earthen drain is present along the project road, at some locations (especially at built-up sections) RCC drains are provided. The location of the RCC drains are given in the following table

Sl. No	Existing km		Drain	Side
	From	To		
1	81/054	81/174	RCC	RHS
2	83/070	83/470	RCC	Both Sides
3	85/700	85/825	RCC	RHS
4	87/500	87/540	RCC	RHS
5	87/650	87/775	RCC	Both Sides
6	87/835	88/020	RCC	Both Sides
7	89/740	89/910	RCC	RHS
8	90/015	90/210	RCC	RHS
9	90/475	90/675	RCC	RHS
10	95/760	91/015	RCC	RHS
11	91/085	91/120	RCC	RHS

Source: Road Inventory, 2019

(iii) **Chithode to Erode Road (SH 15)** is having 4 minor bridges located at km 153/360, km 156/230, km 159/215 and km 159/715. RCC drain is observed along the project stretch at built-up sections, also the earthen drain is present along the project road. The location of the RCC drain is given in the following table

Sl. No	Existing km	Drain	Side
1	154/653	RCC	Both Sides
2	154/870	RCC	Both Sides

Sl. No	Existing km	Drain	Side
3	155/370	RCC	RHS
4	160/690	RCC	RHS
5	160/808	RCC	Both Sides

Source: Road Inventory, 2019

Minor Bridge at km 159/215

Slab Culvert at km 154/870

(iv) **Kanchipuram – Cheyyar Road (SH 116)** has 1 major bridge for River Palar crossing (km 4/876**)** and 2 minor bridges located at km 8/940 and km 11/178 respectively. The earthen drain is present along the project road, at 2 locations (especially at built-up sections) RCC drains are provided. There are no existing storm water drain/roadside drains near water bodies

Sl No	Existing km		Drain	Side
	From	To		
1	3/000	3/400	RCC Covered/Lined	LHS
2	9/800	10/000	RCC Covered/Lined	Both

Source: Road Inventory, 2019

Major Bridge (Palar River) at km 4/876

Minor Bridge at km 8/940

(v) **Erode – Chennimalai Road (MDR 108)** has 5 stream crossings, where minor bridges are provided. The locations of the minor bridges are given in the following table

Sl No	Existing km	Type of Bridge
1	4/585	Minor Bridge (Nala)
2	9/650	Minor Bridge (Nala)
3	12/630	Minor Bridge (Nala)
4	14/700	Minor Bridge (Canal)
5	23/255	Minor Bridge (Nala)

Source: Road Inventory, 2019

Minor Bridge at km 4/585

Minor Bridge at km 14/700

The earthen drain is present along the project road, at some locations (especially at built-up sections) RCC drains are provided. The location of the RCC drains is given in the following table. However, there are no dedicated drain facilities near the water bodies (Surface water Ponds) located at km 5/100, km 6/050, km 9/280, km 21/620 and km 23/850.

Sl No	Existing km		Drain	Side
	From	To		
1	0/000	1/000	RCC	Both Sides
2	1/400	1/800	RCC	LHS
3	4/000	4/200	RCC	Both Sides
4	4/200	4/400	RCC	LHS
5	8/400	9/400	RCC	Both Sides
6	11/000	13/800	RCC	Both Sides
7	19/000	20/200	RCC	Both Sides
8	21/400	23/000	RCC	Both Sides

Source: Road Inventory, 2019

Slab Culvert at km 4/000

Slab Culvert at km 19/000

(vi) **Ariyalur - Reddipalayam Road (SH 139)** is having 2 minor bridges located at km 4/405 and km 9/135. RCC drain is observed along the project stretch at built-up sections, also the earthen drain is present along the project road. The location of the RCC drain is given in the following table

Sl. No	Existing km	Drain	Side
1	0/407	RCC	Both Sides
2	0/563	RCC	Both Sides
3	6/715	RCC	Both Sides
4	7/214	RCC	Both Sides
5	7/478	RCC	Both Sides

Minor Bridge at km 9/135

Slab Culvert at km 0/569

(vii) **Arcot – Arani Road (SH 4)** has 12 stream crossings, where minor bridges are provided. The locations of the minor bridges are given in the following table.

Sl.no	Existing Km	Type of Bridge	Water body
1	2/200	Minor Bridge	Stream Crossing
2	2/500	Minor Bridge	Drain Crossing
3	4/400	Minor Bridge	Stream Crossing
4	7/400	Minor Bridge	Stream Crossing
5	7/500	Minor Bridge	Stream Crossing
6	10/800	Minor Bridge	Stream Crossing
7	10/850	Minor Bridge	Stream Crossing
8	15/500	Minor Bridge	Stream Crossing
9	19/200	Minor Bridge	Stream Crossing
10	21/900	Minor Bridge	Stream Crossing
11	22/750	Minor Bridge	Stream crossing
12	24/150	Minor Bridge	Stream Crossing

Source: Road Inventory, 2019

The earthen drain is present along the project road, at some locations (especially at built-up sections) RCC drains are provided. The location of the RCC drains is given in the following table. However, there are no dedicated drain facilities near the water bodies.

Sl. No	Existing km		Drain	Side
	From	To		
1	8/400	8/600	RCC	RHS
2	10/200	10/400	RCC	RHS
3	14/800	15/000	RCC	RHS

Source: Road Inventory, 2019

Minor Bridge at km 4/400

Slab Culvert at km 3/900

5.1.12 Ponds and Tanks

As per the inventory survey conducted for the project roads, the following surface water bodies are identified. Most of the water bodies are seasonal and the water has been used for irrigation purposes. While performing design for the project roads, it shall be made sure that the surface water bodies are getting affected. As part of the enhancement measures, consultations shall be performed with the local communities in developing the water body as a more useful resource for the community as well as a recreation place for them. The enhancement measures include desilting, strengthening the bund/ bund protection measures, providing steps for the users, providing landscaping, etc. As per the requirement of the communities, the enhancement measures shall be arranged.

Sl.no	Project Roads	Chainage	Waterbody
1.	Omalur to Mecheri (SH 222)	10/800 (RHS)	Water Pond
2.	Malliyakarai to Attur (SH 30)	-	No water bodies available within the Project influence area
3.	Chithode to Erode (SH 15)	158/420 (RHS)	Water Pond
4.	Kanchipuram to Cheyyar (SH 116)	2/290 (RHS) 2/950 (LHS) 5/300 (RHS) 6/170 (RHS) 6/300 (LHS) 8/000 (RHS) 11/340 (LHS) 11/750 (RHS) 12/500 (RHS) 13/800 (RHS) 14/100 (RHS)	Water Pond Water Pond Water Pond Water Pond Water Pond Water Pond Water Pond Water Pond Water Pond Water Pond Water Tank
5.	Erode to Chennimalai (MDR 108)	5/100 (RHS) 6/050 (RHS) 9/280 (LHS) 21/620 (LHS) 22/850 (LHS)	Water Pond Water Pond Water Pond Water Pond Water Pond
6.	Ariyalur to Reddipalayam (SH 139)	0/850 (LHS) 2/350 (LHS) 3/000 (RHS) 3/680 (RHS) 7/000 (both Sides)	Water Pond Water Pond Water Tank Water Pond Water Tank
7.	Arcot to Arnai (SH 4)	6/200 (RHS) 7/800 (RHS) 8/200 (RHS) 8/500 (RHS) 10/200 (RHS) 12/500 (RHS) 18/000 (RHS) 21/900 (LHS) 22/100 (LHS)	Water Pond Water Tank Water Tank Water Tank Water Pond Water Tank Water Pond Water Tank Water Tank

Source: Road Inventory, 2019

Water body located at Km 158/420 (SH 15)

Water body located at km 2/950 (SH 116)

5.1.13 Groundwater Quality

As per the secondary information obtained from the Central Groundwater Board (CGWB) on the groundwater quality for the project districts, the groundwater quality in Salem district is colorless, odorless and slightly alkaline. Electrical conductivity is above1000 µS/cm. Total hardness, Nitrate, Fluoride, and Sulfate concentration are exceeding the prescribed water quality standards (IS 10500). Groundwater quality is categorized as highly saline by the CGWB and is not suitable for irrigation purposes. Hence, groundwater should be treated for drinking purposes. Groundwater quality in Erode district is colorless, odorless and slightly alkaline. Except for the Total Hardness and Nitrate all other key parameters are well within the drinking water permissible limits. The groundwater is suitable for drinking and irrigation purposes. Similar to the Erode district, with exemption to total hardness and Nitrate, the groundwater quality in Ariyalur district is observed to be suitable for drinking and domestic purpose. Groundwater quality in Ranipet district is colorless, odorless and slightly alkaline. With exemption to Total Hardness, Chloride, and Nitrate all other key drinking water parameters are well within the prescribed limits. However, the Sodium Adsorption Ratio (SAR) is slightly higher in concentration and hence, the groundwater may not be suitable for irrigation purposes. Groundwater quality in the Kanchipuram district reflects the similar scenario of Ranipet district.

5.2 Biological Environment

5.2.1 Flora

a) Forest Cover in Project Districts

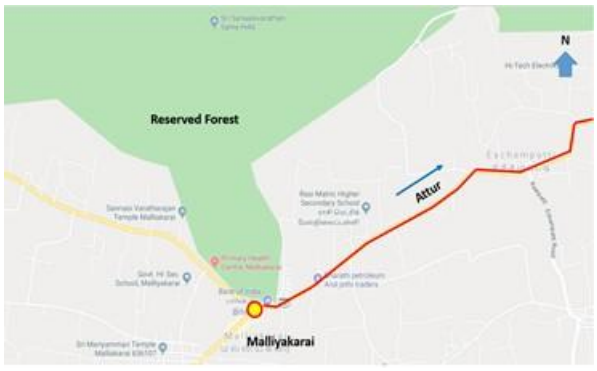
The project districts are having significant areas covered under the Forest. As per the Forest Survey of India (FSI), the Erode district has the highest forest area in comparison with other project districts. The following table illustrates the type of forest.

Sl.no	Project District	Geographic area	Very Dense Forest	Moderate Dense Forest	Open Forest	Total
1)	Salem	5237	199	759	525	1483
2)	Erode	5760	408	1127	772	2307
3)	Thiruvanamalai	6188	234	595	483	1312
4)	Kanchipuram	4483	0	72	238	310
5)	Ariyalur	1940	0	43	337	380
6)	Ranipet[5]	Not available				

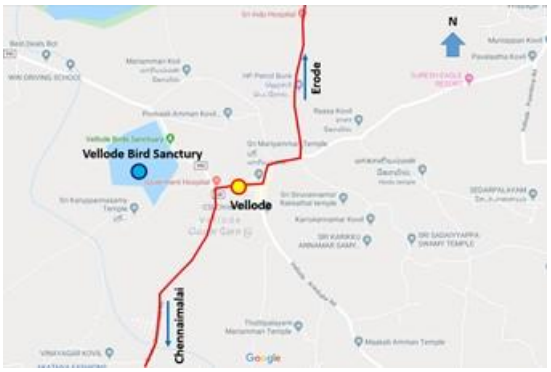
Source: Forest Survey of India (FSI), 2017

[5] Ranipet is a newly formed district for which the forest details are not available

The project road SH – 30 (Malliyakarai to Attur Road) starts near a reserved forest it is also called as Sri Sanaasivarathan Samy Hills, no major wildlife activities have been observed or recorded. The hill has been accessed by the devotees to reach the temple located on top of the hill lock. The project road MDR - 108 (Erode to Chennimalai Road) traverses near the Vellode Bird Sanctuary located at Vellode. It is a declared bird sanctuary by the Forest department, GoTN.



Reserve Forest located at the start point of the SH -30 (Malliyakarai to Attur Road)



Vellode Bird Sanctuary Located within 2km radius from MDR - 108 (Erode to Chennimalai Road)

b) Project Roadside Flora

As per the inventory conducted for the project roads, kilometer wise avenue trees and other vegetation have been identified and recorded. The recorded information shall be utilised for estimating appropriate compensation if the proposed design has any impact on the avenue trees.

- In SH 222 (Omalur to Mecheri), it was estimated to have 1833 avenue trees (909 trees in the RHS and 924 trees in the LHS). The common trees observed along the project road includes Arasu Maram (Pepal tree) - *Ficus religiosa*, Jambolan Tree - *Syzygium cumini,* Palm tree – *Arecaceae*, Tamarind tree - *Tamarindus indica*, Neem Tree - *Azadirachta indica*, Pungan Tree - *Millettia pinnata*, Coconut Tree - *Cocos nucifera*, Kona puliyanga tree - *Pithecellobium dulce*, Mango tree - *Mangifera indica*, Teak Tree - *Tectona grandis* and Illupai Tree - *Madhuca longifolia*.
- In SH 30 (Malliyakarai to Attur Road), it was estimated to have 831 avenue trees (419 trees in the RHS and 412 trees in the LHS). The common trees observed along the project road includes Tamarind tree - *Tamarindus indica,* Neem Tree - *Azadirachta indic,* Coconut Tree - *Cocos nucifera,* Pungan Tree - *Millettia pinnata,* Badam Tree - *Prunus dulcis*, Ala tree - *Ficus benghalensis*, Ashoka tree - *Saraca asoca*, Mango tree - *Mangifera indica* and Palm tree – *Arecaceae*.
- In SH 15 (Chithode to Erode Road), it was estimated to have 825 avenue trees (428 trees in the RHS and 392 trees in the LHS). The common trees observed along the project road includes Tamarind tree - *Tamarindus indica,* Neem Tree - *Azadirachta indic,* Coconut Tree - *Cocos nucifera,* Pungan Tree - *Millettia pinnata,* Badam Tree - *Prunus dulcis*, Mango tree - *Mangifera indica,* Palm tree – *Arecacea,* Portia tree - *Thespesia populnea* and Gulmohar tree - *Delonix regia*.
- In SH 116 (Kanchipuram to Cheyyar Road), it was estimated to have 795 avenue trees (361 trees in the RHS and 434 trees in the LHS). The common trees observed along the project road includes Ala tree - *Ficus benghalensis*, Tamarind tree - *Tamarindus indica,* Neem Tree - *Azadirachta indic,* Coconut Tree - *Cocos nucifera,* Pungan Tree - *Millettia pinnata,* Badam Tree - *Prunus dulcis*, Mango tree -

Mangifera indica, Palm tree – *Arecacea,* Portia tree - *Thespesia populnea*, Gulmohar tree - *Delonix regia* and Myrobalan tree - *Terminalia chebula*.

- In MDR 108 (Erode – Chennimalai Road), it was estimated to have 3029 avenue tress (1494 trees in the RHS and 1535 trees in the LHS). The common trees observed along the project corridor include Tamarind tree - *Tamarindus indica,* Neem Tree - *Azadirachta indic,* Coconut Tree - *Cocos nucifera,* Pungan Tree - *Millettia pinnata,* Badam Tree - *Prunus dulcis*, Mango tree - *Mangifera indica,* Palm tree – *Arecaceae*. In which nearly 60% constituted by Coconut trees followed by Palm trees (20%).
- In SH 139 (Ariyalur Reddipalayam Road), it was estimated to have 2285 trees (1184 trees in the RHS and 1101 trees in the LHS). The common trees observed along the project corridor include Ala tree - *Ficus benghalensis*, Peepal Tree - *Ficus religiosa*, Ashoka tree - *Saraca asoca*, Badam tree - *Prunus dulcis*, Bael tree - *Aegle marmelos*, coconut tree- *Cocos nucifera*, Gulmohar tree- *Delonix regia*, Guava - *Psidium guajava*, Mango - *Mangifera indica*, Neem tree- *Azadirachta indica*, palm – *Arecaceae*, Plumeria - *Plumeria rubra*, Ponga tree - *Cyathea dealbata*, Tamarind tree- *Tamarindus indica* and Teak tree - *Tectona grandis*.
- In SH 4 (Arcot to Arani), it was estimated to have 2297 trees (979 trees in the RHS and 1318 trees in the LHS). The common trees observed along the project road includes Tamarind tree - *Tamarindus indica,* Pungan Tree - *Millettia pinnata,* Badam Tree - *Prunus dulcis*, Mango tree - *Mangifera indica,* Palm tree – *Arecacea,* Coconut Tree - *Cocos nucifera,* Neem Tree - *Azadirachta indic*, Portia tree - *Thespesia populnea* and Gulmohar tree - *Delonix regia*.

Sl No	Project Corridors	RHS Tree No's	LHS Tree No's	Total No's of Trees
1	Omalur To Mecheri	909	924	1833
2	Malliyakarai To Attur	419	412	831
3	Chithode To Erode	428	397	825
4	Kanchipuram To Cheyyar	361	434	795
5	Erode to Chennimalai	1494	1535	3029
6	Ariyalur Reddipalayam	1184	1101	2285
7	Arcot to Arani	979	1318	2297

Source: Road Inventory, 2019

Avenue trees (Palm trees) in the SH -222 (km 12/100)

Avenue trees (Tamarind trees) in the SH - 30 (km 82/00)

5.2.2 Fauna

The project districts Salem and Erode have rich faunal biodiversity (especially Avi Fauna) due to the presence of the Western Ghats. Because of the influence, more bird species shall be observed in these districts. Likewise, during the inventory, the following bird species have been witnessed. Other Faunal species observed are

Table 12: Bird species observed in the Project Roads

Sl.no	common Name	Scientific Name
1.	Indian Peafowl	*Pavo cristatus*
2.	Doves	*Columbidae*
3.	Paradise Flycatcher	*Terpsiphone*
4.	Bulbuls	*Pycnonotidae*
5.	Kingfisher	*Alcedinidae*
6.	Coppersmith	*Megalaima haemacephala*
7.	Barbet	*Megalaimidae*
8.	Drongos	*Dicruridae*
9.	Grey Francolin	*Francolinus pondicerianus*
10.	Golden oriole	*Oriolus kundoo*
11.	Common Iora	*Aegithina tiphia*
12.	White-rumped shama	*Copsychus malabaricus*
13.	House Crow	*Corvus splendens*

c) Protected areas (Wildlife Sanctuary)

Vellode Birds Sanctuary is situated in Vadamugam, Vellode Village, Perundurai Taluk, Erode District of Tamil Nadu. It is located about 12 km from Erode on the Erode-Chennimalai Road (MDR 108). It has an area of 77.185 ha. The sanctuary is located between 11°15'20" N to 11°04'50" and 77°38'40" E to 77°39'30" E. The following bird species are observed in the sanctuary and also noted that none of the bird species are registered as endangered or vulnerable as per the International Union for Conservation of Nature (IUCN).

Table 13: Bird Species Observed within the Vellode Bird Sanctuary

Sl.no	common Name	Scientific Name
1.	Indian Spot-billed Duck	*Anas poecilorhyncha*
2.	Little Grebe	*Tachybaptus ruficollis*
3.	Spotted Dove	*Streptopelia chinensis*
4.	Laughing Dove	*Streptopelia senegalensis*
5.	Greater Coucal	*Centropus sinensis*
6.	Blue-faced Malkoha	*Phaenicophaeus viridirostris*
7.	Asian Koel	*Eudynamys scolopaceus*
8.	Eurasian Moorhen	*Gallinula chloropus*
9.	Eurasian Coot	*Fulica atra*
10.	Gray-headed Swamphen	*Porphyrio poliocephalus*
11.	White-breasted Waterhen	*Amaurornis phoenicurus*
12.	Painted Stork	*Mycteria leucocephala*
13.	Oriental Darter	*Anhinga melanogaster*
14.	Great Cormorant	*Phalacrocorax carbo*
15.	Purple Heron	*Ardea purpurea*
16.	Cattle Egret	*Bubulcus ibis*
17.	Black Kite	*Milvus migrans*

Sl.no	common Name	Scientific Name
18.	Indian Golden Oriole	*Oriolus kundoo*
19.	White-browed Wagtail	*Motacilla maderaspatensis*
20.	Yellow-billed Babbler	*Turdoides affinis*

Source: Department of Forest, GoTN

5.3 Social Environment

5.3.1 Demographic and Administrative Profile of Project Areas

The following sections give a comparative picture of the various demographic and socio-economic indicators (as per census 2011) for the project areas.

(i) **Omalur to Mecheri Road (SH 222):** The project corridor passes through six villages of Omalur taluk and 5 villages of Mettur taluk.

- Omalur taluk: Omalur had a population of 494,861 with 259,550 males and 235,311 females. There were 907 women for every 1000 men. The taluk had a literacy rate of 60.1%. Child population in the age group below 6 was 25,502 Males and 23,203 Females.
- Mettur taluk: Mettur had a population of 417,460 with 217,182 males and 200,278 females. There were 922 women for every 1000 men. The taluk had a literacy rate of 63.91%. Child population in the age group below 6 was 19,653 Males and 17,652 Females

(ii) Malliyakarai to Attur Road (SH 30): The project corridor passes through five villages of Attur taluk. According to 2011 census, Attur had a population of 61,793 with a sex-ratio of 1,021 females for every 1,000 males, much above the national average of 929. A total of 6,147 were under the age of six, constituting 3,209 males and 2,938 females

(iii) Chithode to Erode Road (SH 15): The project corridor passes through five villages of Erode taluk. According to the 2011 census, the taluk of Erode had a population of 820,720 with 410,323 males and 410,397 females. There were 1000 women for every 1000 men. The taluk had a literacy rate of 73.5%. Child population in the age group below 6 was 35,016 Males and 33,498 Females.

(iv) Kancheepuram to Cheyyar Road (SH 116): The project corridor passes through 3 villages/ settlements of Kancheepuram taluk of Kancheepuram district, 4 villages/ settlements of Cheyyaru taluk and 4 villages/ settlements of Vandavasi taluk of Tiruvannamalai district:

- Kancheepuram taluk: Kanchipuram had a population of 497,149 with 248,632 males and 248,517 females. There were 1,000 women for every 1,000 men. The taluk had a literacy rate of 72.92%. Child population in the age group below 6 was 24,301 Males and 23,737 Females.
- Cheyyaru taluk: Cheyyar had a population of 342343 with 171769 males and 170574 females. There were 993 women for every 1000 men. The taluk had a literacy rate of 69.08%. Child population in the age group below 6 was 16555 Males and 16052 Females.
- Vandavasi taluk: Vandavasi had a population of 335,507 with 167,480 males and 168,027 females. There were 1003 women for every 1000 men. The taluk had a literacy rate of 67.94%. Child population in the age group below 6 was 16,017 Males and 15,486 Females

(v) Erode to Chennimalai Road (MDR 108): The project corridor passes through nine villages/settlements of Perundurai taluk. According to the 2011 census, the taluk of Perundurai had a population of 269,600 with 135,850 males and 133,750 females. There were 985 women for every 1000 men. The taluk had a literacy rate of 67.84%. Child population in the age group below 6 was 10,358 Males and 9,818 Females. The population of nine project villages will be the immediate beneficiaries of the project.

(vi) Ariyalur to Reddipalayam Road (SH 139): The project corridor passes through five villages/settlements of Ariyalur taluk. According to the 2011 census, the taluk of Ariyalur had a population of 255749 with 126931 males and 128818 females. There were 1015 women for every 1000 men. The taluk had a literacy rate of 64.54%. Child population in the age group below 6 was 13812 Males and 12795 Females.

(vii) Arcot to Arni Road (SH 4): The project corridor passes through 5 villages/ settlements of Arcot taluk of Vellore district and 5 villages/ settlements Arani taluks of Tiruvannamalai district

- Arcot taluk: Arcot had a population of 247118 with 122941 males and 124177 females. There were 1010 women for every 1000 men. The taluk had a literacy rate of 71.68%. Child population in the age group below 6 was 12439 Males and 11859 Females
- Arani taluks: Arani had a population of 294207 with 146850 males and 147357 females. There were 1003 women for every 1000 men. The taluk had a literacy rate of 71.68. Child population in the age group below 6 was 14866 Males and 14186 Females

Table 14: Administrative Profile of the Project Area

Sl No	Road Name	District	Taluk	Village/ Settlement
1	Four laning and strengthening of Kanchipuram-Cheyyar (SEZ) (SH 116) (km.2/915 – km. 14/112) including Vandavasi Byepass, connecting SH 116 & SH 05 (km 36.457 to km 39.829).	Kancheepuram and Tiruvannamalai	Kancheepuram Cheyyar and Vandavasi	• Sevilimedu • Punchaiyarasunthangal • Apdhullapuram • Ayyangar Kutu Road • Dhusi • Mamundur • Dharmapuram • Santhaimedu • Narasamangalam • Narasamangalam Mankal X-Road
2	Four laning and strengthening of Omalur - Mecheri (SH222) (km. 0/000 – km. 14/600)	Salem	Omalur and Mattur	• Omslur • Pschsnspstti • Karuppanapatti • Tindamangalam • Kalipatti • Kattaperiyampatti • Olaippatti • Aranguanur • Chinnasattappadi • Mecheri
3	Strengthening and widening of Attur - Malliyakarai	Salem	Attur	• Malliyakarai • Eachampatti • Chokkanathapuram

Sl No	Road Name	District	Taluk	Village/ Settlement
	road(SH30) (km.81/054 – km. 89/250)			• Thandavarayapuram • Narasingapuram
4	Ooty – Kothagiri – Mettupalayam – Sathy – Gobi – Erode road (SH-15) (km. 153/600 – km. 161/620)	Erode	Erode	• Kumilamparappu • Suriampalayam • Ganapuram • Periasemur • Erode town
5	Erode – Chennimalai (MDR-108) (km. 0.00 – km. 24.000)	Erode	Perunthurai	• Erode • Soorampatti • Rangampalayam • Goundachipalayam • Vellode • Thaneerpanthal • Ottaparai • Nammakalpalayam • Chennimalai
6	Ariyalur – Reddipalayam (SH139) (km. 1.40 – km. 11.600)	Ariyalur	Ariyalur	• Valajanagaram • Vengadakrisnapuram • Asthinapuram • Periyanagalur (pirivu)
7	Arcot – Arni road (SH4) (km 0/000-km 24/600)	Vellore and Tiruvannamalai	Vellore/ Ranipettai and Arni	• Arcot, • Timiri, • Mosure, • Vanakkampadi, • Thamarapakkam, • Sangeethavadi, • Tajpura, • Uppupettai, • Paratharami • Appanthangal, • Velleri, • Athanur, • Irumbedu

6 Analysis of Alternatives

During the entire stage of the project preparation, comprising screening and detail design preparation, various alternatives were identified and analyzed to help in decision making.

6.1 With and Without project alternatives

The “With” project scenario with positive/beneficial impacts on the traffic conditions shall vastly improve the environment resulting in the betterment of social and economic development of the region. In comparison, the “Without” project scenario shall further deteriorate the present traffic conditions and adversely affect the environmental conditions and quality of life. Other factors like infrastructure development, economic analysis, and other project benefits were also taken into consideration for analysing with and without project scenarios.

6.2 Highway design alternatives

During the project design stage, the road alignment and cross-section options have been identified based on applicable design standards related to traffic growth, pavement strength, design requirements, consideration of safety aspects, etc.,

6.2.1 Realignment Alternatives

Omalur to Mecheri Road (SH 222) starts at Omalur (km 0/000) from the SH 86 and ends at Mecheri (km 14/600), immediately at a distance of km 0/250, there is a level crossing. As per the discussion held with the TNRSP, it is proposed to construct a Rail Over Bridge (RoB) in that location, however, based on the inventory it is anticipated to have significant social impacts concerning the structures as it is a commercial area and a major junction is located within 150m from the level crossing. Hence to avoid the impacts, realignment options have been explored. 3 best options have been studied. The outcome of the analysis is discussed in the following sections

- **Option 1:** It is a Greenfield alignment for a distance of 1.25 km, proposed to have 4 box culverts, 1 ROB and 1 VUP/VOP. The existing land use in the realignment section is mostly agriculture and the total number of structures that are likely to be affected is 22. It is proposed to have 45m to 50m RoW. Total land acquisition for the realignment option is estimated to be 6.74 ha and the cost for the same is 4.47 crores. The construction cost is estimated to be 37.18 crores and total project cost (including the R&R) is 41.64 crores.

Merits	Demerits
• It provides better connectivity and smooth passage through traffic and trucks. • Length of Alignment is comparatively less, Extent of Land Acquisition is less and the Project cost is also comparatively less • ROB is proposed across the railway line which eases the movement of traffic • Environmental impact due to noise and air pollution will be less compared to other options	• As the alignment passes through highly cultivated farms and built-up sections, it involves the acquisition of a large extent of highly fertile farmland.

- **Option 2:** It is a Greenfield alignment for a distance of 1.60 km, proposed to have 4 box culverts, 1 minor bridge, 1 ROB, and 1 VUP/VOP. The existing land use in the realignment section is mostly agriculture and the total number of structures that are likely to be affected is 37. It is proposed to have 45m to 50m RoW. Total land acquisition for the realignment option is estimated to be 8.47 ha and the cost for the same is 6.09 crores. The construction cost is estimated to be 44.42 crores and total project cost (including the R&R) is 50.51 crores.

Merits	Demerits
• It provides better connectivity and smooth passage through traffic and trucks. • ROB is proposed across the railway line which eases the movement of traffic • Environmental impact due to noise and air pollution will be less compared to other	• As the alignment passes through highly cultivated farms, it involves acquisition of a large extent of highly fertile farmland. • More number of Buildings are getting affected compared to other Options • As the proposed alignment crosses a

options	water tank, a minor bridge has to be constructed • Project cost is high in comparison with option - I • Getting clearance from the Irrigation department will be difficult as alignment is passing through a water tank. • The alignment traverse close to a Grave Yard

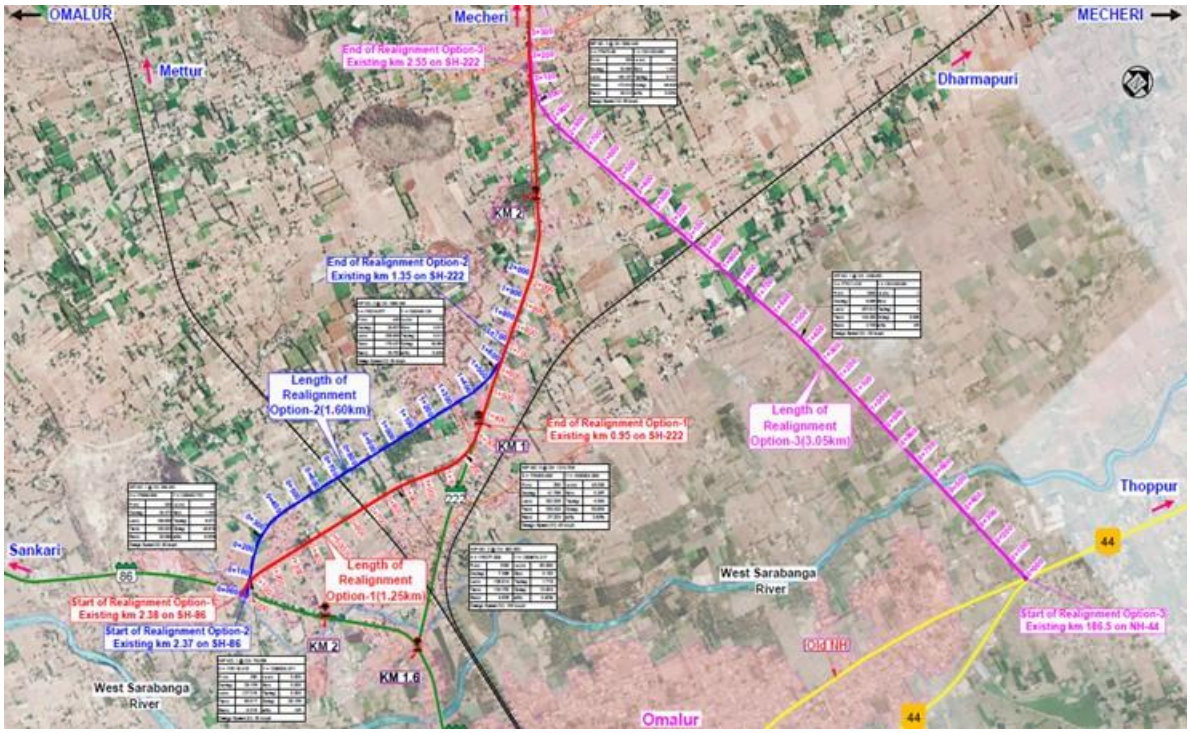


Figure 13: Realignment Options for SH -222

- **Option 3:** It is proposed to widen in an existing MDR for a distance of 3.05 km and proposed to have 1 major bridge, 15 Box culverts, 1 ROB and 1 VUP/VOP. The existing land use in the realignment section is mostly agriculture and partly dry land. The total number of structures that are likely to be affected is 20. It is proposed to have 45m to 50m RoW. Total land acquisition for the realignment option is estimated to be 15.65 ha and the cost for the same is 8.82 crores. The construction cost is estimated to be 68.73 crores and total project cost (including the R&R) is 77.55 crores.

Merits	Demerits
• It provides better connectivity and smooth passage through traffic and trucks. • ROB is proposed across the railway line which eases the movement of traffic • Direct Connectivity to NH traffic, Thus through traffic is avoided entering Omalur town	• As the alignment passes through highly cultivated farms, it involves acquisition of a large extent of highly fertile farmland. • Length of the alignment is more, when compared with the other two options • Total Project cost is high in comparison with the other two options

Merits	Demerits
	• As this option connects NH-44 with project road, the traffic from and to Omalur has to use the existing road from start till the end of the realignment (i.e., Km 0/000 to Km 2/550 of SH 222) and has to cross railway level crossing.

Based on the analysis, Option-1 was chosen for implementation. Details of the comparison are enclosed in **Annexure 1**.

7 Potential Environmental and Social Impacts and Mitigation Measures

This section assesses the nature, type, and magnitude of the potential impacts that are likely to the physical environment, biological environment and social environment due to the implementation of the proposed project interventions on the project roads.

7.1 Environmental Impact Assessment

7.1.1 Impact on the Topography

Being an existing road, the implementation of the proposed interventions from 2 lanes to 4 lane configuration and 2 lanes with pave shoulders configuration shall not have any significant impact on the topography and terrain. As per the inventory, the project roads are having a flat terrain and hence the anticipated impact on the terrain is negligible

7.1.2 Impact on the Geology

The proposed project interventions are subjected to the widening of the existing roads, all the project road sections are having flat terrain and hence no significant impact on geology is anticipated. For the construction of the project roads, the supply of materials is required which should be collected/ procured from approved quarry sites. Likely impact on the geology is expected due to the uncontrolled blasting in the quarries supplying aggregates for construction at these sites. As these quarries are licensed, the prevalent rules on blasting will be adhered to. Hence, the impact on the general geology of the region is insignificant.

7.1.3 Impact on Air Quality

With the implementation of the project, there will be emissions from the traffic. Emissions from asphalt hot-mix plants, transportation of construction materials and vehicular movement along the project roads will have a temporary but significant impact on air quality during project construction. Felling/ removal of avenue trees for the widening purposes shall have a direct impact on air quality. A major contributor to the air pollutants in the area during project operation would be attributed to the increase in road traffic. The details of the sensitive receptors located along the project corridors are given in the **Annexure 2.** The summary of the potential locations/ sensitive receptors are given in the following table

Table 15: Sensitive Receptors in the Project Corridors

Sl.no	Project Corridors	Schools	Colleges	Hospitals	Cultural properties
1.	Omalur to Mecheri Road (SH 222)	3	1	2	8
2.	Malliyakarai to Attur Road (SH 30)	2	-	2	6

3.	Chithode to Erode Road (SH 15)	4	2	3	8
4.	Kanchipuram to Cheyyar Road (SH 116)	3	-	5	24
5.	Erode to Chennimalai Road (MDR 108)	5	3	2	20
6.	Ariyalur to Reddipalayam Road (SH 139)	5	-	1	10
7.	Arcot to Arni Road (SH 4)	9	5	2	35

Source: Road Inventory, 2019

7.1.4 Impact on Noise Quality

During the project construction, there will be an increase in noise levels due to the movement of the construction vehicles and construction-related activities (including clearing/ grubbing, demolition, etc.,) in the project area. Setting up of hot mix plant/ batching plant will increase the local noise level; however, it is temporary and will last till the construction works are over, construction activities near the sensitive areas (near Vellode Bird Sanctuary (km 13/000)) have to be regulated in the day time. It is suggested to restrict the construction activities during the bird's breeding season (monsoon and winter seasons (October to February)). The project implementation will have a permanent impact on the sensitive areas (Refer table 15 and **Annexure 2**) due to continuous traffic flow. Demarcated “no horn zones” and vehicle movement has to be restricted in the sensitive area during night time.

7.1.5 Impact on the Drainage and Water Quality

The project roads are characterized by several small streams, perennial and seasonal rivers (refer section 5.1.8). As per the road inventory, all the project corridors are not subject to flooding. However, between Erode to Chennimali Road (MDR 108), a lined drain crosses the RUB at Km 2/900, as the drain size is inefficient to cater the flow of water, in case of excess discharge, water spills out of drain thereby causing flooding at RUB locations. These issues shall be mitigated through appropriate design measures. Other than this, during the project construction happens especially during the monsoon seasons, the surface runoff and construction waste might impact the water resource and will deteriorate the water quality. Hence, appropriate drainage management measures have been built into project designs. Besides, baseline monitoring was carried out to establish water quality such that construction stage impacts can be effectively managed. In terms of EMP measures, the location of construction facilities has been excluded for at least 500m. Other key measures include

- Natural drainage at the site shall not be disturbed/ altered and the proposed design for drains/ CD’s shall be in line with the existing conditions
- During the construction period, a suitable barrier shall be used to protect the adjoining water bodies from the falling earth materials and debris to avoid sedimentation
- Wherever required, suitable sub-surface drains shall be provided for the full width of the formation
- Water from lakes/ponds/ tanks will not normally be used to meet the water requirement for construction purposes
- Silt traps should be provided near the water bodies

7.1.6 Impact on Water Bodies

Water bodies comprising of ponds, tanks, and lakes have been observed along the project roads. Mostly post-project impacts due to these water bodies would be negligible since

they are mostly located away from the road edge, with few exceptions where the village ponds are adjacent to the project roads. In such cases, there could be a considerable impact, especially during the construction stage. The project corridors that are proposed to be widened from 2 lane configuration to 4 lane configuration will have a significant impact on the water bodies. In this package, the corridors SH 222, SH 15, SH 116 and SH 4 are proposed for 4 lane widening and hence based on the road inventory details as well as the proposed RoW the water bodies that are likely to be impacted are listed in the following table

Sl.no	Project Roads	Chainage	Water body
1.	Omalur to Mecheri Road (SH) 222	10/800 (RHS)	Water Pond
2.	Chithode to Erode Road (SH) 15	158/420 (RHS)	Water Pond
3.	Kanchipuram to Cheyyar Road (SH) 116	2/290 (RHS)	Water Pond
		5/300 (RHS)	Water Pond
		6/170 (RHS)	Water Pond
		11/340 (LHS)	Water Pond
		12/500 (RHS)	Water Pond
		14/100 (RHS)	Water Tank
4.	Arcot to Arni Road (SH) 4	7/800 (RHS)	Water Tank
		12/500 (RHS)	Water Tank
		22/000 (LHS)	Water Tank

Source: Road Inventory, 2019

As per the CGWB information on the groundwater availability/ status, the project corridors SH 222 and SH 4 are falling under Overexploited areas, which is followed by SH 15 (critical area) and SH 116 (Semi critical area), hence to enhance the groundwater recharge capacity the project roads shall fit in with rainwater harvesting structures. The listed water bodies shall be preserved through specific EMP measures which include physical cordoning, exclusion of location of construction facilities, prevention of water extraction for construction purposes. Besides, baseline monitoring has been carried out in all such locations to monitor the impacts. As an enhancement measure, water bodies shall be protected through the provision of bund strengthening measures, landscaping, etc., which shall be provided in consultation with the local communities.

7.1.7 Impacts on Forests and Wildlife

The project road MDR 108 (Erode to Chennimalai) traverses through Vellode, where the Vellode bird sanctuary is located within a 2 km radius and the project road SH 30 (Malliyakarai to Attur) falls under the influence (less than 200m) of the reserved forest in Malliyakarai. Though the sensitive areas are located nearby, the project roads are not having any land acquisition/ land alienation from the forest land. For all other project roads, there are no sensitive areas concerning wildlife and forests. The EMP includes appropriate mitigation measures for the MDR 108 during the project construction, it is suggested to restrict the construction activities in the Vellode Bird Sanctuary area during the breeding season (October to February) and providing restriction for using sound horn during the operation stage. The field studies carried out in the reserved forest (Malliyakarai area) confirmed the absence of wildlife and hence, implementation of the construction activities do not have any direct impact on the RF. However, during the project construction, the removal of trees/twigs for burning or cooking purposes by the labors should be avoided.

7.1.8 Impact on Avenue Plantation

The proposed road improvements including upgradation and widening for 104.185 km of Phase-I and Phase – II roads shall have a direct impact on the avenue trees alongside the project roads. Based on design optimization such as concentric/one side widening depending on the location of trees, adjusting the vertical profile, providing sidewalls, etc., the impact has been considerably reduced. The tree inventory has been carried out as part of the project preparation to identify the trees that are likely to get affected by the proposed interventions. Trees with economic importance like tamarind trees, coconut trees, and mango trees are also getting affected due the widening proposal. Out of which, tamarind trees are observed to have maximum impacts. However, it varies with respect to the project corridors, it was estimated to be 1997 tamarind trees shall have direct impact, due to that there will be an economic loss of nearly 4 lakhs per annum to the Highways Department (auction from tamarind fruit/pods). Project corridor wise tamarind trees are given in the following table.

Sl.No	Road Name	Number of Tamarind Trees	% of Tamarind Trees
1	Omalur-Mecheri	314	31.46
2	Malliyakarai-Attur	448	57.00
3	Chithode-Erode	396	52.24
4	Kanchi-Cheyyar	177	26.14
5	Erode – Chennimalai	57	1.88
6	Ariyalur-Reddipalyam	356	16.15
7	Arcot-Arni	249	10.83

Source: Road Inventory, 2019

For the affected trees as a compensatory measure, 1:10 trees shall be planted (as directed by the High court of Madras vide G.O no 704, dated 03/08/2010). The EMP has provided necessary landscaping, budgetary provisions, and implementation arrangements. The landscaping locations include project roads, public/government spaces, schools, and community-owned lands.

7.1.9 Sensitive Receptors

There are several sensitive receptors (refer table 15 and **Annexure 2**) along the project roads including, schools/colleges, hospitals, places of religious importance. During the construction and post-project scenarios, these locations would be impacted due to air and noise pollution and traffic hazards. Considering the possible impacts, each of the sensitive receptor locations is inventoried and location-specific impact assessments have been carried out. Based on this, site-specific measures have been designed and most of the measures have been integrated into construction contracts in the form of environmental management specifications. Some of the typical measures include the following:

- Appropriate traffic management at each of the location during the construction phase and exclusion of construction facilities within 500m radius,
- Provision of compound walls for the schools/sensitive public spaces and channelizing the pedestrian movement,
- Combination of noise barriers and landscape measures,
- Extensive road safety measures at all the sensitive locations, etc.

7.1.10 Road Safety

Based on the public consultation, accident data and the observed ribbon development along the project corridors, the Black Spots (mostly on the junctions) are identified. The same will be analysed to determine the cause of accidents. A detailed study will be made in order to remove the black spots by adopting engineering improvements. At black spot locations and habitations suitable safety precautions viz., adequate sight distance, provision of sign boards, illuminations, rumble strip, road markings etc., will be proposed. The ribbon development across the project corridors are given in the following table.

Table 16: Ribbon Development along the Project Corridors

8 Sl.no	9 Project Roads	10 Ribbon Development sections	11 Chainage
1.	Omalur to Mecheri (SH 222)	Omalur	km 0/350
		Paalikadai	km 3/350
		Panjukalipatti	km 4/000
		Chinthamaniyur aprivu	km 4/800
		Tharamangalam	km 6/220
		Chinnasattappadi	km 8/500
		Sathapadi	km 9/000
		Mecheri	km 14/000
2.	Malliyakarai to Attur (SH 30)	Malliakarai,	km 81/500
		Eachampatti	km 83/160
		Thandavarayapuram	km 87/340
		Narasingapuram	km 91/100
3.	Chitode to Erode (SH 15)	Chithode	km 153/900
		Kongampalayam	km 156/600
		Mamarathupalayam	km 156/900
		Periyasemur	km 158/040
		Maligainagar	km 159/320
		Veerappanchatram	km 161/000
4.	Kanchipuram to Cheyyar (SH 116)	Selvimedu	km 2/915
		Punjai Arasanthangal	km 5/700
		Abdullapuram	km 6/700
		Dusi	km 7/700

8 Sl.no	9 Project Roads	10 Ribbon Development sections	11 Chainage
		Mamundur	km 10/000
		Cheyyar SPICOT	km 13/000
5.	Erode to Chennimalai (MDR 108)	Erode	km 1/100
		Kasipaalayam	km 2/000
		Rangapalayam	km 3/000
		Mutham palayam	km 6/000
		Kauvundachipalayam	km 9/000
		Vellode	km 14/000
		Mayiladi	km 19/200
		Chennimalai	km 24/000
6.	Ariyalur to Reddipalayam (SH 139)	Ariyalur	km 1/200
		Valajanagram	km 2/800
		Venkatakrishnapuram	km 3/000
		Astinapuram	km 6/000
		Kattupiringiyam	km 7/400
		Reddipalayam	km 11/000
7.	Arcot to Arani (SH 4)	Arcot	km 0/000
		Thoppukana	km1/100
		Uppupet	km 3/500
		Timiri	km 8/000
		Vilari	km 9/700
		Thamaraipakkam	km 6/000
		Velleri	km 19/100
		Erumbedu	km 24/800

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

7.1.11 Cultural Properties and Heritage Sites

There are no Heritage sites identified along the project roads and its influence areas, this has been confirmed about the list of ASI monuments identified and recorded in the state of Tamil Nadu. However, the project roads pass adjacent to several cultural properties such as temples, mosques, and churches in urban and rural sections. These places could be either physically impacted or could be vulnerable to traffic hazards. Given this, all such places have been surveyed and utmost care was taken in designing horizontal alignment to

minimise the impact. However, the impacts are non-mitigable in some places due to design constraints. In such locations, a consensus was drawn with the stakeholders for either relocation and/or adequate enhancement measures. All such measures have been evaluated and necessary implementation provisions have been integrated with the Resettlement Action Plan (RAP).

7.1.12 Environmental Enhancement Measures

The project could lead to several impacts relating to community and common property resources such as community severance, access issues, crossings, etc. While all such impacts are adequately addressed through design measures, the most important aspect that needs to be addressed is creating a positive impact along the project corridors. In this regard, several environmental enhancement measures will be integrated into to project implementation and such measures include:

- Avenue tree plantation along the project roads and provision for landscaping in the major junctions as well as in the median. New plantation will be proposed along the project roads, cluster development will be proposed wherever additional land is available. Tree plantation is also proposed at sensitive locations including schools, hospitals and institutions, where it will act as a noise barrier, etc. The maintenance of the trees along with that of the road shall be included in the agreement of the contractor. Corridor specific landscaping plan shall be prepared during the detailed design/DPR.
- Enhancement of roadside village ponds/ water bodies (refer section 7.1.6 (list of water bodies)) including protection of banks and fencing, construction of steps, desilting, etc.,
- Water harvesting structures along the project roads,
- Provision of solar street lights at sensitive receptors and places of cultural importance,
- Cleaning of feeder channels to minor irrigation tanks,
- Landscaping of ox-bow areas created after road geometric corrections, etc.

7.2 Social Impact Assessment

The Social Impact Assessment (SIA) has been performed to identify congested areas, potential impacts on the community and settlement to provide the basic information to the engineering design team to integrate it with technical design. The thrust of this integration is to minimize the adverse impacts, if any, with the best possible engineering solutions at the most appropriate cost. A social screening survey has been done based on the cross-section/widening plan applicable for each project's roads.

7.2.1 Properties likely to be affected

The properties likely to be affected by the proposed road improvement are surveyed using structured questionnaires. Within the entire stretch, the most vulnerable stretch is the settlements along the project roads. These settlements include houses, shops, commercial complexes, petrol pumps, community properties, temples, small religious shrines, etc. The social screening survey indicates that there is a significant number of structures on both sides of the project roads. A total of 3,738 structures/assets are likely to be affected due to the implementation of the project. The number of properties likely to be affected and its distance from the existing centerline for each project road is depicted in Table 17. This data will help the design team to further examine the corridor impact of the project

Table 17: Project roads and ROW considered for social screening

Sl No	Project Corridors	Corridor Length	Proposed Widening	RoW for screening survey	No. of structure affected
1.	Omalur to Mecheri Road (SH 222)	14.6	4 Lane	26m in urban and 31 in Rural Section	**637**
2.	Malliyakarai to Attur Road (SH 30)	8.196	2 Lane	18 in Urban and 24 in Rural section	**201**
3.	Chithode to Erode Road (SH 15)	8.02	4 Lane	26 in urban and 30 in Rural Section	**548**
4.	Kanchipuram to Cheyyar Road (SH 116)	14.569	4 Lane	26 in urban and 30 in Rural Section	**560**
5.	Erode to Chennimalai Road (MDR 108)	24	2 Lane	18 in Urban and 24 in Rural section	**847**
6.	Ariyalur to Reddipalayam Road (SH 139)	10.2	4 Lane	26 in urban and 30 in Rural Section	**39**
7.	Arcot to Arni Road (SH 4)	24.6	4 Lane	26 in urban and 31 in Rural Section	**906**

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

The impact on private agriculture land has also been assessed based on the available RoW. The extent of the land to be acquired corridor wise is given in the following table

Sl.no	Project Corridors	Extent of land to be Acquired (in ha)
1	Omalur to Mecheri Road (SH 222)	7.4076
2	Malliyakarai to Attur Road (SH 30)	2.45
3	Chithode to Erode Road (SH 15)	0.45
4	Kanchipuram to Cheyyar Road (SH 116)	26.30
5	Erode to Chennimalai Road (MDR 108)	14.76
6	Ariyalur to Reddipalayam Road (SH 139)	5.832
7	Arcot to Arni Road (SH 4)	20.16

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

7.2.2 Loss of land

The available right-of-way (RoW) shall fully be optimized for the proposed improvements. The exact alignment of the RoW is being determined using village FMB (Field Measurement Book) maps. In many areas, the existing RoW is not enough to meet the design requirements of the cross-sections. As per the analysis, the available land area in the Existing Right of Way (EROW) is 223.4 Ha, the additional land required for the proposed improvements are worked out to be 83.7 Ha. The land plan schedules (LPS) are being prepared and the precise number of titleholders and extent of land will be updated once the LPS work is completed. The road wise tentative land acquisition is given in the below table.

Sl.No	Road Name	EROW(Ha)	PROW (Ha)	Additional Land (Ha)
1	Omalur-Mecheri	32.48	40.58	8.10
2	Malliyakarai-Attur	19.18	23.18	4.00
3	Chithode-Erode	21.93	22.97	1.04
4	Kanchi-Cheyyar	27.48	56.12	28.64
5	Erode – Chennimalai	37.00	51.76	14.76
6	Ariyalur-Reddipalyam	31.69	38.72	7.03

7	Arcot-Arni	53.61	73.77	20.16

Source: Preliminary land acquisition plan, Feedback Infra Private Limited, December 2019

7.2.3 Category of the Affected Properties

The total number of properties likely to be affected due to the project is estimated to be 3,738 in number. Of these 1,074 are residential buildings, 1,535 are commercial buildings and 503 are residential cum commercial buildings. Road wise details are presented in table 18.

Table 18: Category of the Affected Properties

Category of the structures	Numbers			Percentage (%)
	LHS	RHS	Total	
Kanchipuram to Cheyyar Road (SH 116)				
Residential	81	116	197	35.18
Commercial	86	97	183	32.68
Residential/Commercial	33	71	104	18.57
Religious	5	18	23	4.11
Educational	1	0	1	0.18
Health institution	1	0	1	0.18
Govt/Community	5	11	16	2.86
Others	14	21	35	6.25
Subtotal	**226**	**334**	**560**	**100**
Omalur to Mecheri Road (SH 222)				
Residential	79	78	157	24.65
Commercial	98	102	200	31.4
Residential/Commercial	25	78	103	16.17
Religious	5	3	8	1.26
Educational	0	2	2	0.31
Health institution	0	0	0	0
Govt/Community	5	2	7	1.1
Others	35	125	160	25.12
Subtotal	**247**	**390**	**637**	**100**
Malliyakarai to Attur Road (SH 30)				
Residential	47	46	93	46.27
Commercial	34	18	52	25.87
Residential/Commercial	20	6	26	12.94
Religious	8	0	8	3.98
Educational	0	0	0	0
Health institution	0	0	0	0
Govt/Community	6	5	11	5.47
Others	9	2	11	5.47
Subtotal	**124**	**77**	**201**	**100**
Chithode to Erode Road (SH 15)				
Residential	44	27	71	12.96
Commercial	170	141	311	56.75
Residential/Commercial	67	29	96	17.52
Religious	8	8	16	2.92
Educational	0	2	2	0.36
Health institution	2	3	5	0.91
Govt/Community	10	1	11	2.01
Others	4	32	36	6.57

Category of the structures	Numbers			Percentage (%)
	LHS	RHS	Total	
Subtotal	**305**	**243**	**548**	**100**
Erode to Chennimalai Road (MDR 108)				
Residential	129	148	277	32.7
Commercial	196	190	386	45.57
Residential/Commercial	23	26	49	5.79
Religious	6	14	20	2.36
Educational	1	0	1	0.12
Health institution	0	4	4	0.47
Govt/Community	12	8	20	2.36
Others	35	55	90	10.63
Subtotal	**402**	**445**	**847**	**100**
Ariyalur to Reddipalayam Road (SH 139)				
Residential	6	9	15	38.46
Commercial	5	1	6	15.38
Residential/Commercial	2	0	2	5.13
Religious	0	1	1	2.56
Educational	0	1	1	2.56
Health institution	0	0	0	0
Govt/Community	0	0	0	0
Others	9	5	14	35.9
Subtotal	**22**	**17**	**39**	**100**
Arcot to Arni Road (SH 4)				
Residential	141	123	264	29.14
Commercial	201	196	397	43.82
Residential/Commercial	57	66	123	13.58
Religious	17	22	39	4.30
Educational	1	10	11	1.21
Health institution	1	1	2	0.22
Govt/Community	9	5	14	1.55
Others	28	28	56	6.18
Subtotal	**455**	**451**	**906**	**100.00**
Grand Total	**1781**	**1957**	**3738**	**700**

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

7.2.4 Type of construction of the affected properties

As per the analysis of the social screening survey, the maximum number of the constructed structures, which are likely to be impacted within the corridor of impact, is Pucca structures 2,170 (58.05%), followed by semi Pucca structures 971 (25.98%). 6.5 percent of buildings are kutcha/temporary in nature and the remaining 9.7% are falling in other categories (lean-to roof, a portion of compound wall, water tap, toilet, bathrooms, etc.). Type of construction of the likely to be affected structures are summarized in Table 19.

Table 19: Type of Construction of the Affected Properties

Type of construction	Numbers			Percentage (%)
	LHS	RHS	Total	
Kanchipuram to Cheyyar Road (SH 116)				
Pucca	110	205	315	56.25
Semi pucca	89	73	162	28.93

Type of construction	Numbers			Percentage (%)
	LHS	RHS	Total	
kutcha	13	35	48	8.57
Others	14	21	35	6.25
Subtotal	**226**	**334**	**560**	**100**
Omalur to Mecheri Road (SH 222)				
Pucca	91	119	210	32.97
Semi pucca	98	114	212	33.28
kutcha	23	32	55	8.63
Others	35	125	160	25.12
Subtotal	**247**	**390**	**637**	**100**
Malliyakarai to Attur Road (SH 30)				
Pucca	56	27	83	41.29
Semi pucca	41	39	80	39.8
kutcha	18	9	27	13.43
Others	9	2	11	5.47
Subtotal	**124**	**77**	**201**	**100**
Chithode to Erode Road (SH 15)				
Pucca	165	74	239	43.61
Semi pucca	105	110	215	39.23
kutcha	31	27	58	10.58
Others	4	32	36	6.57
Subtotal	**305**	**243**	**548**	**100**
Erode to Chennimalai Road (MDR 108)				
Pucca	276	327	603	71.19
Semi pucca	85	57	142	16.77
kutcha	6	6	12	1.42
Others	35	55	90	10.63
Subtotal	**402**	**445**	**847**	**100**
Ariyalur to Reddipalayam Road (SH 139)				
Pucca	0	1	1	2.56
Semi pucca	6	3	9	23.08
kutcha	7	8	15	38.46
Others	9	5	14	35.9
Subtotal	**22**	**17**	**39**	**100**
Arcot to Arni Road (SH 4)				
Pucca	378	341	719	79.36
Semi pucca	64	87	151	16.67
kutcha	8	20	28	3.09
Others	5	3	8	0.88
Subtotal	**455**	**451**	**906**	**100**
Grand Total	**1781**	**1957**	**3738**	**700**

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

7.2.5 Magnitude of Impact on Structures

The magnitude of the impact on the affected structure is presented in Table 20. Out of 3738 structures that are assessed to be affected, 2396 (64.10%) structures are evaluated to be fully affected (extent of impact ranges between 80 to 100%). 559 structures are assessed to be affected by up to 80% of the building's plinth area. Only 20 buildings are surveyed as an impact of less than 10%.

Table 20: Extent of loss to the likely affected structures

The extent of impact (%)	Numbers			Percentage (%)
	LHS	RHS	Total	
Kanchipuram to Cheyyar Road (SH 116)				
0 to 10	1	3	4	0.71
>11 to 20	2	12	14	2.5
>20 to 40	0	95	95	16.96
>40 to 60	32	105	137	24.46
>60 to 80	14	45	59	10.54
>80 to 100	177	74	251	44.82
Subtotal	**226**	**334**	**560**	**100**
Omalur to Mecheri Road (SH 222)				
0 to 10	12	0	12	2.64
>11 to 20	1	0	1	0.22
>20 to 40	7	2	9	9.91
>40 to 60	16	11	27	7.49
>60 to 80	33	50	83	11.89
>80 to 100	178	327	505	51.32
Subtotal	**247**	**390**	**637**	**83.48**
Malliyakarai to Attur Road (SH 30)				
0 to 10	0	0	0	0
>11 to 20	0	0	0	0
>20 to 40	0	0	0	0
>40 to 60	10	0	10	4.98
>60 to 80	0	0	0	0
>80 to 100	114	77	191	95.02
Subtotal	**124**	**77**	**201**	**100**
Chithode to Erode Road (SH 15)				
0 to 10	3	0	3	0.55
>11 to 20	21	2	23	4.2
>20 to 40	72	14	86	15.69
>40 to 60	54	38	92	16.79
>60 to 80	47	43	90	16.42
>80 to 100	108	146	254	46.35
Subtotal	**305**	**243**	**548**	**100**
Erode to Chennimalai Road (MDR 108)				
0 to 10	0	0	0	0
>11 to 20	1	2	3	0.35
>20 to 40	5	1	6	0.71
>40 to 60	26	52	78	9.21
>60 to 80	83	166	249	29.4
>80 to 100	287	224	511	60.33
Subtotal	**402**	**445**	**847**	**100**
Ariyalur to Reddipalayam Road (SH 139)				
0 to 10	0	0	0	0
>11 to 20	1	0	1	2.56
>20 to 40	9	4	13	33.33
>40 to 60	3	3	6	15.38
>60 to 80	3	4	7	17.95
>80 to 100	6	6	12	30.77
Subtotal	**22**	**17**	**39**	**100**

The extent of impact (%)	Numbers			Percentage (%)
	LHS	RHS	Total	
Arcot to Arni Road (SH 4)				
0 to 10	1	0	1	0.11
>11 to 20	1	3	4	0.44
>20 to 40	19	19	38	4.19
>40 to 60	57	63	120	13.25
>60 to 80	34	37	71	7.84
>80 to 100	343	329	672	74.17
Subtotal	**455**	**451**	**906**	**100.00**
Grand Total	**1781**	**1957**	**3738**	

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

7.2.6 Loss of Livelihood

The project causes a significant impact on 1535 commercial buildings resulting in loss of livelihood to about 6245 households (HHs). The 6245 HHs comprise 1535 business owners, 503 residential cum commercial owners, 3473 tenants, and 2772 employees. The category of impacts causing loss of livelihood is presented in Table 21.

Table 21: Loss of livelihood

Sl .no	Project Roads	Loss of Commercial buildings/ business	Loss of Commercial cum Residential building	Comm. Tenants	Employees	Total
1	Kanchipuram to Cheyyar Road (SH 116)	183	104	439	380	819
2	Omalur to Mecheri Road (SH 222)	200	103	864	602	1466
3	Malliyakarai to Attur Road (SH 30)	52	26	38	58	96
4	Chithode to Erode Road (SH 15)	311	96	843	907	1750
5	Erode to Chennimalai Road (MDR 108)	386	49	215	110	325
6	Ariyalur to Reddipalayam Road (SH 139)	6	2	29	53	82
7	Arcot to Arni Road (SH 4)	397	123	1045	662	1707
Total		**1535**	**503**	**3473**	**2772**	**6245**

Source: Preliminary social impact assessment survey, Feedback Infra Private Limited, December 2019

7.2.7 Social Sensitive Locations and Recommended Mitigation Measures

Settlements along the project roads are the major hotspots concerning involuntary resettlement (IR) impact. Reduced ROW or development of the road within ROW has been suggested at all settlement areas to reduce the involuntary resettlement impact. Site-specific design proposals shall be developed giving importance to safety at settlement areas. Around 104 religious structures would also be affected due to this project; appropriate design options shall be developed to avoid/ minimise the impact on religious structures. Consultation with representatives of religious structures is being done and the same shall be given in the road-specific ESIA documents. The road wise hotspots and mitigation measures proposed are summarised in the below table.

Table 22: Social sensitivity and mitigation measures recommended

12 Road	13 Hotspots	14 Nature of sensitivity	15 Mitigation proposed
16 Omalur - Meacheri	• Omalur (km 0/350), • Paalikadai (km 3/350) • Panjukalipatti (km 4/000), • Chinthamaniyur aprivu (km 4/800), • Tharamangalam (km 6/220), • Chinnasattappadi (km 8/500), • Sathapadi (km 9/000) • Mecheri (km 14/000)	17 Presence of residential and commercial buildings	18 Concentric widening within available land
	• There are 4 schools, 3 hospitals, 8 temples and a graveyard observed in the project road	Loss of community assets and worship place	Avoid or minimise the impact by adopting appropriate measures during detailed design
Malliyakarai – Attur SH 30 (km. 81/054 to km. 91/200)	• Malliakarai (km 81/500), • Eachampatti (83/160), • Thandavarayapuram (km 87/340), • Narasingapuram (km 91/100),	Presence of residential and commercial buildings	Concentric widening within available land
	• There are 2 schools, 2 hospitals, 5 temples and a Church which was observed in the project road	Loss of community assets and worship place	Avoid or minimise the impact by adopting appropriate mitigation measures during detailed design
Chithode to Erode SH 15 (km. 153/600 to km.	• Chithode (km 153/900), • Kongampalayam (km 156/600), Mamarathupalayam (km	Presence of residential and commercial buildings	Concentric widening within available land

12 Road	13 Hotspots	14 Nature of sensitivity	15 Mitigation proposed
161/620)	156/900), • Periyasemur (km 158/040), • Maligainagar (km 159/320) and Veerappanchatram (km 161/000)		
	• There are 8 temples, 5 Schools and 1 hospital which was observed along the project road	Loss of community assets and worship place	Avoid or minimise the impact by adopting appropriate mitigation measures during detailed design
Kanchipuram – Cheyyar (SEZ) SH 116 (km. 2/915 to km. 14/112) including Vandavasi bypass, connecting SH 116 & SH 05	• Selvimedu (km 2/915), • Punjai Arasanthangal (km 5/700), • Abdullapuram (km 6/700), • Dusi (km 7/700), • Mamundur (km 10/000) and • Cheyyar SPICOT (km 13/000)	Presence of residential and commercial buildings	Concentric widening within available land
	• 23 temples, 1 graveyard, 1 mosque, 3 Schools/college, and 3 hospitals were observed along the project road	Loss of community assets and worship place	Avoid or minimise the impact by adopting appropriate mitigation measures during detailed design
Erode – Chennimalai MDR 108 (km. 0/000 to km. 24/000)	• Erode (km 1/100), • Kasipaalayam (km 2/000), • Rangapalayam (km 3/000), • Mutham palayam (km 6/000), Kauvundachipalayam (km 9/000), • Vellode (km 14/000), • Mayiladi (km 19/200) and • Chennimalai (km 24/000))	Presence of residential and commercial buildings	Concentric widening within available land
	• There are 20 temples, 7	Loss of	Avoid or minimise

12 Road	13 Hotspots	14 Nature of sensitivity	15 Mitigation proposed
	Schools and 2 hospitals that were observed along the project road	community assets and worship place	the impact by adopting appropriate mitigation measures during detailed design
Ariyalur – Reddipalayam SH 139 (km. 1/400 to km. 11/600)	• Ariyalur (km 1/200), • Valajanagram) km 2/800), Venkatakrishnapuram (km 3/000), • Astinapuram (km 6/000), • Kattupiringiyam (km 7/400) and • Reddipalayam (km 11/000)	Presence of residential and commercial buildings	Concentric widening within available land
	• There are 10 temples, 5 Schools/college and 1 hospital observed along the project road	Loss of community assets and worship place	Avoid or minimise the impact by adopting appropriate mitigation measures during detailed design
Arcot – Arni SH 04 (km. 0/000 to km. 24/600)	• Arcot (km 0/000), • Thoppukana (km1/100), • Uppupet (km 3/500), • Timiri (km 8/000), • Vilari (km 9/700), • Thamaraipakkam (km 6/000), • Velleri (km 19/100) and • Erumbedu (km 24/800)	Presence of residential and commercial buildings	Concentric widening within available land
	• There are 33 temples, 1 mosque, 1 church, 3 temple arches, 16 Schools/college and 1 hospital observed along the project road	Loss of community assets and worship place	Avoid or minimise the impact by adopting appropriate mitigation measures during detailed design

7.2.8 Labour Influx Management

According to preliminary estimates, approximately 50-150 workers would be required for each of the project corridors, of which 30%-50% may be brought in from other states including West Bengal, Bihar and North-eastern states of India. Migrant labour may be semi-skilled or may be brought in where the requirement of labour is large. Preference would be given to offering these jobs to PAPs and other local people. The bid documents specify that the contractor shall give preference to local villagers for unskilled labour requirement. However skilled labour would also be required for technical support and construction. The skilled workers could be primarily migrant labours from places outside the state of Tamil Nadu

The basic issues related to migrant labour may include

- Location of labour camps will need to be identified on all seven corridors
- Conflict amongst workers, and the local community, based on cultural, religious or behavioural practices
- Discontent amongst the local community on the engagement of outsiders
- Mild outbreaks of certain infectious diseases due to interactions between the local and migrant populations. The most common of these are respiratory (TB), vector-borne (Malaria, Dengue), waterborne (Stomach infections, typhoid) and sexually transmitted diseases (HIV, Syphilis, and Hepatitis);
- Security issues to local women from the migrant workforce;
- Use of community facilities such as health centres, temples, transport facility, etc. by migrant labour may lead to discontent with the local community
- In case contractors bring in unskilled migrant labour, there stands the risk of exploitation of a labourer. This can happen in the form of hiring underage labourers low and unequal wage payments, forced labour and discrimination based on caste, religion or ethnicity

Labour influx assessment and management plan shall be developed for each project road and the same shall be presented in the corridor-specific ESIA report.

8 Environmental and Social Management Plan (ESMP)

The Environmental and Social Management Plan (ESMP) has been prepared based on the outcome of the environmental and social assessment carried out for the project roads. Each project roads shall have project-specific EMP's provided with roles and responsibility for implementing the same. For the purpose of the summary, the project activity based mitigation measures are highlighted in the following table. The project road-specific ESMP's shall form part of the bidding document/ contract agreement.

Table 23: Environmental and Social Management Plan

Project Activities	Management Measure
PRE-CONSTRUCTION STAGE	
Pre-construction activities by PIU	
Land Acquisition	The land will be acquired following the provisions of Tamil Nadu Highway Act, 2001 and the compensation will be determined following India's new Land Acquisition and Rehabilitation and Resettlement Act, (RFCTLARR Act, 2013)
Tree Cutting	• As far as possible maximum efforts shall be made to minimize the number of trees proposed to be felled by adopting suitable on the spot adjustment of engineering designs. • Trees shall be removed from the Corridor of Impact (CoI) and construction sites before the commencement of construction. Prior

Project Activities	Management Measure
	Permission shall be obtained from the Forest Department for the felling of trees. • The trees cut shall be disposed of through auction (inclusive of tree stumps). This disposal shall be done immediately to ensure that the traffic movement is not disrupted. Progress of tree cutting shall be reported to the PIU.
Utility Relocation and Common Property Resources (CPR's)	• All community utilities and common property resources such as stand posts bore wells, wells, water supply lines, toilets, sewage lines, drainage systems, optical fiber cables, electric power supply lines, transformers, irrigation pump houses, telephone and television cables shall be relocated and restored before the commencement of the road improvement activity. • While relocating these utilities and facilities, all concerned agencies including PIU shall take necessary precautions and shall provide barricades/delineation of such sites to prevent accidents including accidental fall into boreholes, pits, drains both during demolition and construction/ relocation of such facilities. Standard safety practices shall be adopted for all such works. • Early completion of works for schools, colleges and health centers including shifting of gates and construction of boundary walls shall be planned during holidays so that the risk of accidents and disturbance to the day-to-day activity of such institutions are minimized. • Proper placement (as per codes) of passenger shelters/bus stops shall be ensured to prevent distress to the commuters and passengers. • Access to the Common Property Resources (CPR's) shall be maintained • Relocation sites for all CPRs shall be selected in consultation with concerned communities, local administrative authorities/departments.
Relocation of Cultural and Religious Properties	• All cultural properties within the CoI, whose structure is getting affected fully, shall be relocated at suitable locations, as desired by the community; and for partially impacted structures enhancement measures shall be applied at the same sites before construction begins, depending on the availability of space, the requirement of the communities and fund availability. • No cultural properties or religious structures shall be removed or relocated without the knowledge and written consent of the concerned parties or communities and local administration as the case may be. Sites for the relocation of these religious structures shall be identified following the choice of the community. • As far as possible, the architectural elements of the structure should be conserved/reflected/translated into the design of new structures following the wishes of the community • Proper drainage and garbage disposal at such sites shall be ensured to prevent unhygienic conditions, blocking of drains, etc. at/near relocated structures. Garbage collection bins, soak pits or other appropriate measures shall be provided apart from the simple enhancement of such sites.
Orientation of Implementing Agencies	The PIU shall organize orientation sessions during all stages of the project. This shall include on-site training (general as well as specific to the context of this subproject) as well. These sessions shall involve the concerned division-level staff of the TNRSP involved in the project, Staff of the Site Engineer/ Supervision Consultant and the Contractor.

Project Activities	Management Measure
Pre-construction activities by the Contractor/Engineer of Supervision Consultant	
Joint Field Verification	• The Engineer - Incharge of Supervision Consultant and the Contractor shall carry out joint field verification to ascertain the necessity of saving trees, environmental and community resources wherever such representations or suggestions in writing have been received and forwarded by the project authority or by the site engineer following the local situations (in consultation with the local authority/ interest of community representation). • The complaints/suggestions together with the observations and expert opinion of the joint verification team containing the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the ESMP shall be summarized in a written document containing all the details with date, time, place, and signature of the individuals involved and this shall be sent to PIU/TNRSP for approval. • The PIU shall maintain proper documentation and justifications/reasons in all such cases where deviation from the original ESMP is proposed.
Assessment of Impacts due to Changes/Revisions in the Project Work	The Engineer - Incharge of Supervision Consultant shall assess the anticipated impacts and revise/modify the ESMP in consultation with the PIU/TNRSP in accordance to the recommendation made by the field survey party in the event of changes /revisions (including addition or deletion) in the project's scope of work
Procurement of Machinery	
Crushers, Hot-mix Plants & Batching Plants	• Crushers, hot mix plants, and batching plants shall comply with the requirements and specifications of the relevant current emission control legislation. • Hot-mix and batching plants shall be located 1000m (1km) away from residential/ settlements, forests, wildlife movement areas, and commercial establishments, preferably in the downwind direction. • The Contractor shall submit a detailed layout plan for all such sites and seek prior approval of Engineer - Incharge of Supervision Consultant before entering into a formal agreement with a landowner for setting-up such sites. Actions by Supervision Consultant and PIU/TNRSP against any non-compliance shall be borne by the Contractor at his own cost. • Arrangements to minimize dust pollution through the provision of windscreens, mist spray units, and dust encapsulation shall have to be provided at all such sites. Specifications of crushers, hot mix plants, and batching plants shall comply with the requirements of the relevant current emission control legislation and Consent / NOC for all such plants shall be submitted to the CSC and PIU/TNRSP. • No such installation by the Contractor shall be allowed till all the required legal clearances are obtained from the competent authority and the same is submitted to the PIU/TNRSP and the Supervision Consultant. • Environmental Monitoring (dust and emission) have to be conducted to demonstrate compliance.
Other Construction Vehicles, Equipment and Machinery	• The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment, and machinery to be procured for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. • Noise limits for construction plant and equipment are to be

Project Activities	Management Measure
	procured such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A), when measured at one-meter distance from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. • Efficient and environmentally-friendly equipment confirming to the latest noise and effluent emission control measures available in the market shall be used in the project. • The Contractor shall maintain a record of Pollution under Control (PUC) certificate for all vehicles and machinery used during the contract period, which shall be produced to the PIU/TNRSP and the Supervision Consultant for verification whenever required.
Identification & Selection of Material Sources	
Borrow Areas	• Arrangement for locating the source of supply of material for embankment and subgrade as well as compliance with environmental requirements, as applicable, shall be the sole responsibility of the Contractor. The environmental personnel shall be required to inspect every borrow area location before approval. • Format for reporting shall be as per the Reporting Format enclosed in the ESMP for Borrow Area. The Engineer - Incharge of the Supervision Consultant shall be required to inspect every borrow area location and evaluate such proposals following environmental requirements before issuing approval for use of such sites. • No borrow areas shall be opened within 500m of wildlife movement zones and forest areas. The borrow areas shall be at least 300m from schools and village access roads. • Borrow area should be located at a minimum distance of 300m from the residential/ settlement area. Proper fencing should be provided and access to the borrow areas should be restricted for the locals • The Contractor shall not borrow the earth from the selected borrow area until a formal agreement is signed between landowner and Contractor and a copy of the agreement is to be submitted to the Engineer – In-charge of the Supervision Consultant. The Supervision Consultant shall report these facts to the PIU/TNRSP along with the remarks in the prescribed format with documentary proofs. • Planning of haul roads for accessing borrows materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate it as per Borrow Area guideline given in the Environmental Management Framework (EMF) or as approved by the Engineer – In-charge of Supervision Consultant. • Haul roads shall be maintained throughout the operation period of the borrow areas by undertaking the required maintenance and repair works, which may include strengthening, pothole repairing, and diversions. Improvements shall be done to reduce inconvenience to users of these roads, residents living along the haul roads and minimize air and water pollution. • Such measures shall include, but not limited to, frequent sprinkling of water, repairing of the road, road safety provisions (warning and informatory signage, flagmen, etc.), and ensuring covering of loaded vehicles by waterproof tarpaulin; consultation with public and special precautions are required when measures are implemented near schools, health centers, and settlement areas.

Project Activities	Management Measure
	• All borrow areas whether in private, community or govt. the land shall be restored either to the original condition or as per the approved rehabilitation plan immediately upon completion of the use of such a source.
Quarries	• The Contractor shall identify materials from existing licensed quarries with suitable materials for construction. Apart from approval of the quality of the quarry materials, the Engineer's representative shall verify the legal status of the quarry operation, as to whether approval from the Department of Geology and Mining, GoTN is obtained. • No quarry and/or crusher units shall be selected or used, which is within 1000m from the forest boundary, wildlife movement path, breeding and nesting habitats, and national parks/sanctuaries. No quarry or plants can be set-up within 1000m from the residential/ settlement locations • Contractor shall also work out haul road network used for quarry transport and report to Engineer - Incharge of Supervision Consultant who shall inspect and in turn report to PIU/TNRSP on the suitability of such haul roads from the safety of residents, biodiversity and other environment points of views.
Arrangement for Construction Water	• The Contractor shall source the requirement of water preferentially from surface water bodies, as rivers and tanks in the project area. The Contractor shall be allowed to pump only from the surface water bodies. Boring of any tube wells shall be prohibited. To avoid disruption/disturbance to other water users, the Contractor shall extract water from fixed locations. The Contractor shall consult the local people before finalizing the locations. • Only at locations where surface water sources are not available, the Contractor can contemplate the extraction of groundwater. Consent from the Engineer that "no surface water resource is available in the immediate area for the project" is a pre-requisite before extraction of groundwater. The Contractor shall need to comply with the requirements of the PWD – Water Resources Department. GoTN and seek their approval for doing so.
Sand (all river and stream beds used directly or indirectly for the project)	• The Contractor shall identify sand quarries with requisite approvals for the extraction of sand. In case of selection of new sites for sand quarrying, the Contractor shall obtain prior approval and concurrence from Competent District Authority and the Engineer – Incharge of the Supervision Consultant keeping in view the objections and convenience of the local population, who may restrain such activities for their security and safety. • Where the supplier of sand is another party, the authentic copy of the lease agreement that has been executed between the local Tahasildar and the supplier has to be submitted to Supervision Consultant and PIU/TNRSP of the project, before any procurement is made from such a site. • To avoid accidents and caving in of sandbanks at quarry sites, and shall be removed layer by layer. Digging deeper than the permissible limit has to be completely avoided by the Contractor. Such quarry shall be barricaded 10m away from the periphery on all sides except the entry point, to prevent the accidental fall of domestic cattle, wildlife, and human beings.
Labour Requirements	The Contractor shall use unskilled labor drawn from local communities to avoid any additional stress on the existing facilities (medical

Project Activities	Management Measure
	services, power, water supply, etc.)
Setting up construction sites	
Construction Camp Locations – Selection, Design & Layout	• Construction camps shall not be proposed: o Within 1000m of Ecologically sensitive areas/ zones o Within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The layout of construction camps has to be prepared and approved by the Engineer – Incharge of the Supervision Consultant. • The location for stockyard for construction materials shall be identified at least 1000 m from watercourses. The waste disposal and sewage system for the camp shall be designed, built and operated such that there will no contamination to the soil, groundwater and also ensure that there is no odor generation. • Unless otherwise arranged by the ULB's, arrangements for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by Engineer shall be provided by the Contractor.
Arrangements for Temporary Land Requirement	• The Contractor as per prevalent rules shall carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/ hot mix plants /traffic detours /borrow areas etc. • The Engineer shall ensure that the site is cleared before handing over to the owner (after construction or completion of the activity) and it is included in the contract.
CONSTRUCTION STAGE	
Construction Stage Activities by Contractor	
Site Clearance	
Clearing and Grubbing	• Site clearance including clearance of marked trees for felling and removal has to be carried out much before the actual road construction takes place. • Structures and utilities (cabins, commercial properties, hoardings, overhead power transmission lines, cable connections, telephone lines, bore wells, stand posts, wells, statues, temples, etc.) shall be compensated/relocated as per RAP and ESMP provisions before tree felling; clearing or grubbing activities are to be undertaken as these activities may damage structures (private and govt.) and essential facilities/utilities of public use. • All works shall be carried out in a manner such that the damage or disruption to flora is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from Engineer - Incharge of Supervision Consultant. • The Contractor, under any circumstances, shall not cut or damage trees. Vegetation above 30 cm girth shall be considered as trees and shall be compensated.
Dismantling of Bridgework / Culverts	All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials, and appendage as well as the method of operation from impeding cross-drainage at rivers, streams, water canals, and existing irrigation and drainage systems, or causing flooding.
Generation & disposal of Debris	Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction as follows: • Eighty percent (80%) of the sub-grade excavated from the existing road surface, excluding the scarified layer of bitumen, shall be

Project Activities	Management Measure
	reused in the civil works after improving the soil below the subgrade through the addition of sand and suitable cementing material for qualitative up-gradation. • The dismantled scraps of bitumen shall be utilized for the paving of crossroads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the corridor or in any other manner approved by the Engineer - Incharge of Supervision Consultant. • At locations identified for disposal of residual bituminous wastes, the disposal shall be carried out over a 60 mm thick layer of rammed clay to eliminate the possibility of leaching of wastes into the groundwater. • The Contractor shall suitably dispose of unutilized non-toxic debris either through filling up of borrows areas located in the wasteland or at pre-designated disposal sites, subject to the approval of the Engineer - Incharge of Supervision Consultant. • Debris generated from pile driving or other construction activities along the rivers and streams drainage channels shall be carefully disposed of in such a manner that it does not flow into the surface water bodies or form puddles in the area. • The pre-designated disposal locations shall be part of the Comprehensive Solid Waste Management Plan to be prepared by the Contractor in consultation and with approval of Engineer - Incharge of Supervision Consultant and approval local competent authority.
Non-bituminous construction wastes disposal	The location of disposal sites shall be finalized before completion of the earthworks on any particular section of the road. The Engineer shall approve these disposal sites conforming to the following o These are not located within the designated forest area o The dumping does not impact natural drainage courses o No endangered/rare flora is impacted by such dumping. o Settlements are located at least 1000 m away from the site.
Bituminous wastes disposal	The disposal of residual bituminous wastes shall be done by the Contractor at secure landfill sites, with the requisite approvals for the same from the concerned government agencies.
Stripping, stacking and preservation of topsoil	• The topsoil from all sites including roadside widening and working area, cutting areas, quarry sites, borrows areas, construction camps, haul roads in agricultural fields (if any) and areas to be permanently covered shall be stripped to a specified depth of 150mm and stored in stockpiles for reuse. • A portion of the temporarily acquired area and/or RoW edges shall be earmarked for storing topsoil. The locations for stacking shall be pre-identified in consultation and with approval of Engineer - Incharge of Supervision Consultant. The following precautionary measures shall be taken by the Contractor to preserve the stockpiles until they are re-used: • Stockpile shall be arranged such that the slope does not exceed 1:2 (vertical to horizontal), and height is restricted to 2 m. • To retain soil and to allow percolation of water, the edges of the pile shall be protected by silt fencing. • Multiple handling is to be kept to a minimum to ensure that no compaction occurs. • Such stockpiles shall be covered with empty gunny bags or shall be planted with grasses to prevent loss during rains. • Such stockpiled topsoil shall be utilized for

Project Activities	Management Measure
	○ Covering reclamation sites or other disturbed areas including borrow areas (not those in barren areas) ○ Topdressing of road embankment and fill slopes ○ Filling up of tree pits and in the agricultural fields of farmers, acquired temporarily that need to be restored. • Residual topsoil, if there is any, shall be utilized for the plantation works along the road corridor. • The utilization as far as possible shall be in the same area/close to the same area from where the topsoil was removed. • The stripping, preservation, and reuse shall be carefully inspected, closely supervised and properly recorded by the Supervision Consultant.
Accessibility	• The Contractor shall provide safe and convenient passage for vehicles, pedestrians, and livestock to and from roadsides and property access connecting the project road by providing temporary connecting road and foot path, as necessary. • Construction activities that shall affect the use of side roads and existing accesses to individual properties, whether public or private, shall not be undertaken without providing adequate provision approved by the Supervision Consultant. • The Contractor shall ensure that the public and animals are prevented from entering the construction works. • The Contractor shall take care that the crossroads are constructed in such a sequence that construction work over the adjacent crossroads are taken up in a manner that traffic movement in any given area does not get affected.
Planning for Traffic Diversions and Detours	• Detailed traffic control plans shall be prepared by the Contractor and the same shall be submitted to the Engineer - Incharge of Supervision Consultant for approval. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic arrangement after cessation of work each day, safety measures are undertaken for the transport of hazardous materials and arrangement of flagmen, etc. to regulate traffic congestion. • The Contractor shall provide specific measures for the safety of pedestrians and workers as a part of traffic control plans. • The Contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • The Contractor shall also inform the local community of changes in traffic routes and pedestrian access arrangements with assistance from the Supervision Consultant and TNRSP.
Construction Materials	
Earth from Borrow Areas for Construction	• No borrow area shall be opened without permission of the Engineer – Incharge of Supervision Consultant. • Borrow pits shall not be dug continuously in a stretch. The location, shape, and size of the designated borrow areas shall be as approved by the Engineer and following the IRC recommended the practice for borrow pits for road embankments (IRC 10: 1961). • The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas • The unpaved surfaces used for the haulage of borrow materials shall be maintained dust-free by the Contractor. Since dust rising is the most significant impact along the hauled roads, a sprinkling of

Project Activities	Management Measure
	water shall be carried out twice a day along such roads during their period of use.
Quarries	• The Contractor shall obtain materials for quarries only after the approval of the Department of Geology and Mining, GoTN. A copy of this consent must be submitted to TNRSP/PIU through Engineer – Incharge of Supervision Consultant. • The Contractor shall develop a Comprehensive Quarry Redevelopment Plan, as per the Mining Rules of the State and submit a copy to TNRSP and Supervision Consultant before the opening of the quarry site. • The quarry operations shall be undertaken within the rules and regulations in vogue.
Blasting	• Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the requirements of the following Sub-Clauses of MoRTH 302 besides the law of the land, as applicable. • The Contractor shall at all times take every possible precaution and shall comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives. The Contractor shall at all times when engaged in blasting operations, post sufficient warning flagmen, to the satisfaction of the Engineer. • The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. • Blasting shall be carried out only with the permission of the Engineer. All the statutory laws, regulations, rules, etc., about the acquisition, transport, storage, handling and use of explosives shall be strictly followed. • Blasting shall be carried out during fixed hours (preferably during mid-day) or as permitted by the Engineer. The timing shall be made known to all the people within 1000m (200m for pre-splitting) from the blasting site in all directions. • Blast Management Plan shall be prepared by the Contractor and it needs to be approved by the Engineer – Incharge of Supervision Consultant
Water Extraction	Procurement of water is to be carried out as per "Arrangement for Construction Water". The Contractor shall minimize the wastage of water during construction.
Transporting Construction Materials	• All vehicles delivering materials to the site shall be covered to avoid spillage of materials. • All existing highways and roads used by vehicles of the Contractor, or any of his sub -Contractor or suppliers of materials and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles • The unloading of materials at construction sites close to settlements shall be restricted to daytime only. • Transportation vehicles shall be cleaned before leaving the site
Construction work	

Project Activities	Management Measure
Disruption to other users of Water	• While working across or close to any perennial water bodies, the Contractor shall not obstruct/ prevent the flow of water. • Construction over and close to the non-perennial streams shall be undertaken in the dry season and if such activity is likely to disrupt, constrain or impact the community use of the water body, adequate prior information (at least two weeks in advance) shall be provided to such community. Such water bodies may be limited to ponds, water harvesting structures (WHS), feeder channels to the pond, irrigation sources, etc. • If the supply of water or access to a source is being completely cut off, then the Contractor shall make necessary arrangements to provide water in the interim period. A water quality test shall be done before providing/supplying water. • Wherever excavation results in diversion of water flow shall be required as per the engineering designs, the Contractor shall ensure that such diversion channels have no stepper slopes than 1:2 (V to H). Proper slope protection measures have to be taken as approved by the Engineer - Incharge of Supervision Consultant and TNRSP/PIU. • The Contractor shall take prior approval from PWD –Water Resource Department, GoTN and Supervision Consultant for any such activity. The PIU/TNRSP shall ensure that Contractor has served the notice to the downstream users of water well in advance where such diversion of the flow is likely to affect the downstream population subject to the condition that under no circumstances the downstream flow shall be stopped putting the wildlife, the aquatic fauna, and the shoreline settlement under distress.
Drainage and Flood Control	• The Contractor shall ensure that any construction materials like earth, stone, ash or appendage is disposed of such that it does not block the flow of water of any watercourse and cross drainage channels. • Where necessary adequate mechanical devices to bailout accumulated water from construction sites, campsites, storage yard, excavation areas are to be pre-settled and arranged well in advance of the rainy season besides providing temporary cross drainage systems. • The Contractor shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run-off of sediments is controlled. Silt fencing shall be installed before the onset of the monsoon at all the required locations, as directed by Engineer - Incharge of Supervision Consultant and PIU/TNRSP. • The Contractor shall also ensure that no material blocks the natural flow of water in any watercourse or cross drainage channel. Before monsoon, the Contractor shall provide either permanent or temporary drains to prevent water accumulation or flooding in surrounding residential, commercial and agricultural areas.
Siltation of Water Bodies and Degradation of Water Quality	• The contractor shall construct silt fencing at the base of the embankment construction near all water bodies (including wells) and around the stockpiles at the construction sites. • Silt fencing shall be provided before the commencement of earthwork and shall continue till the stabilization of the embankment slopes is complete on the particular sub-section of the road. • The Contractor shall also put up sedimentation cum grease traps at

Project Activities	Management Measure
	the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies/water channels with a fall exceeding 1.5 m.
Slope Protection and Control of Soil Erosion	• The Contractor shall construct slope protection works as per design, or as directed by the Engineer - Incharge of Supervision Consultant to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fiber mats, mulches, grasses, slope drains and other devices as required under specific local conditions. • Contractor shall ensure the following: o After construction of road embankment, the side slopes of all cut and fill areas shall be graded and covered with stone pitching, grass and shrub as per design specifications. o Turfing works shall be taken up as soon as possible provided the season is favourable for the establishment of grass sods. o Other measures of slope stabilization shall include mulching netting and seeding of batters and drain immediately on completion of earthworks with the sowing of seeds of grass, shrub and bushes 30cm interval from line to line across the slope and sprinkling of water on such slopes after completion of the earthwork. o In borrow pits, the depth shall be regulated so that the sides of the excavation shall not be steeper than 1 vertical to 2 horizontal, from the edge of the bank. o Stabilization of the embankment with appropriate technique/s shall commence soon after the embankment formation.
Pollution Control	
Water Pollution	
Water Pollution from Construction Wastes	• The Contractor shall take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. The contractor shall avoid construction works close to the streams or water bodies during monsoon. • All waste arising from the project is to be disposed of in the manner that is acceptable to the Tamil Nadu State Pollution Control Board (TNPCB) or as directed by Engineer – Incharge of Supervision Consultant. The Engineer – Incharge shall certify that all liquid wastes disposed of from the sites meet the discharge standards.
Water Pollution from Fuel, Lubricants, and Chemicals	• The contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and refuelling shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors shall be provided for vehicle parking, wash down and refuelling areas as per the design provided. • In all, fuel storage and refueling areas are located on agricultural land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after cessation of such storage. • The contractor shall arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites approved by the Engineer – Incharge. All spills and collected petroleum products shall be disposed of following MoEF&CC and TNPCB guidelines. • Engineer – Incharge shall certify that all arrangements comply with the guidelines of TNPCB/ MoEF&CC.
Air Pollution	

Project Activities	Management Measure
Dust Pollution	• The Contractor shall take every precaution to reduce the level of dust (PM_{10} and $PM_{2.5}$) from crushers, material storage yards, haul roads and construction sites (including earthwork, dismantling, scarification and material mixing sites) by sprinkling of water, mist spray, encapsulation of dust source and erection of screen /barriers. • Hot mix plant and batch mix plant shall be fitted with dust extraction units and mist spray to keep down the dust emission levels. The PM_{10} value at a distance of 40m from a unit located in such a cluster should be less than 500 $\mu g/m^3$. • The Contractor shall provide necessary certificates to confirm that all crushers used in the project conform to relevant dust emission control legislation. Air pollution monitoring shall be conducted as per the Environmental Monitoring Plan (EMoP) and results shall be used to strengthen/rectify problematic areas. If other existing crushers are used, such units need to have a valid license from the TNPCB.
Emission from Construction Vehicles, Equipment and Machineries	• The contractor shall ensure that all vehicles, equipment, and machinery used for construction are regularly maintained and conform to the emission standards specified by the TNPCB. Certification issued for such contrivances obtained from designated/approved authority shall be submitted along with the specified reporting format. • The contractor shall maintain a separate file and submit Pollution under Control (PUC) certificates for all vehicles/equipment/machinery used for the project. Monitoring results shall also be submitted to Supervision Consultant and PIU/TNRSP as per the Environmental Monitoring Plan in the specified format.
Noise Pollution	
Noise Pollution: Noise from Vehicles, Plants and Equipment's	The Contractor shall confirm the following: • All plants and equipment used in construction shall strictly conform to the MoEF&CC/ TNPCB noise standards. • All vehicles and equipment used in construction shall be fitted with exhaust silencers. • Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall `be replaced. • Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one-meter distance from the edge of equipment in the free field), as specified in the Environment (Protection) Rules, 1986. • Maintenance of vehicles, equipment, and machinery shall be regular and up to the satisfaction of the Engineer to keep noise levels at the minimum. • Idling of temporary trucks or other equipment shall not be permitted during periods of unloading or when they are not in active use. (MoRTH - Section: 201.2) • At the construction sites within 150m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching shall `be stopped during the night time between 9.00 pm to 6.00 am.

Project Activities	Management Measure
	• No noisy construction activities shall be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors. • The contractor shall provide noise barriers to the suggested locations of select schools/ Temples/health centers. • Monitoring shall be carried out at the construction sites as per the monitoring schedule and results shall be submitted to Engineer-Incharge of Supervision Consultant. The engineer shall be required to inspect regularly to ensure the compliance of ESMP. (Refer MoRTH - Section 111.3)
Safety	
Personal Safety Measures for Labour, Material handling, Painting, etc.	• The contractor shall provide all necessary safety appliances such as safety goggles, high visibility vests, helmets, safety belts, earplugs, masks, boots etc. to workers and staff. • Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete, etc. • Welder's protective eye-shields to workers engaged in welding works • Protective goggles and clothing to workers engaged in stone breaking activities and workers shall be seated at sufficiently safe intervals • Earplugs to workers exposed to loud noise (above 75dB (A)), and workers working in crushing compaction, or concrete mixing operation. • Adequate safety measures for workers during the handling of materials at the site are taken up. • The Contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. • The Contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed for the work of painting with products containing lead in any form. • The Contractor shall also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. • The contractor shall provide facemasks to the workers when the paint is applied in the form of a spray or a surface having dry lead paint is rubbed and scrapped. • The Contractor shall mark ‘hard hat’ and ‘no smoking’ and other ‘high risk’ areas and enforce non-compliance of use of PPE with zero tolerance. These shall be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and shall be approved by Engineer.
Traffic and Safety & Pedestrian Safety	• The Contractor shall take all necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Engineer - Incharge for the information and protection of traffic approaching or passing through the section of any existing crossroads. • The Contractor shall ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. • Pedestrian Safety shall be ensured. Pedestrian circulation shall be demarcated before start & unsafe areas shall be cordoned off

Project Activities	Management Measure
The risk from Electrical Equipment(s)	The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that - • No material shall be so stacked or placed as to cause danger or inconvenience to any person or the public. • All necessary fencing and lights shall be provided to protect the public in construction zones. • All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be free from patent defect, shall be kept in good working order, shall be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer - Incharge. • Precautionary measures shall be taken when working close to the underground or overhead cables
First Aid	The contractor shall arrange for - • A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone • Availability of suitable transport at all times to take an injured or sick person(s) to the nearest hospital • Equipment and trained nursing staff at the construction camp.
Cultural Property	
Chance Found Archaeological Property	• All fossils, coins, articles of the value of antiquity, structures, and other remains or things of geological or archaeological interest discovered on the site are the property of the Government and shall be dealt with as per provisions of the relevant legislation. • The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall, immediately upon discovery thereof and before removal acquaint the Engineer-Incharge of such discovery and carry out the Supervision Consultant instructions for dealing with the same, waiting which all work shall be stopped. • The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.
Labour Camp Management	
Location of Construction labor camps: Accommodation	• The Contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labor to standards and scales approved by the Engineer- Incharge. • The contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction & maintenance of labor camp. • Construction camps shall not be proposed within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic facility provision of each labor camp shall be submitted to Engineer before their construction. • The construction shall commence only upon the written approval of the Engineer - Incharge.
Potable Water	• The Contractor shall construct and maintain all labor accommodation in such a fashion that uncontaminated water is available for drinking, cooking, and washing. within the precincts of every workplace in an accessible place, as per standards set by

Project Activities	Management Measure
	the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996). The contractor shall also guarantee the following: o Supply of sufficient quantity of potable water (as per IS) in every workplace/labor campsite at suitable and easily accessible places and regular maintenance of such facilities. o If any water storage tank is provided that shall be kept such that the bottom of the tank is at least 1m. from the surrounding ground level. o If water is drawn from any existing well, which is within 30mt. the proximity of any toilet, drain or other sources of pollution, the well shall be disinfected before water is used for drinking. o All such wells shall be entirely covered and provided with a trap door, which will be dustproof and waterproof. o A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. o Testing of water shall be done every month as per the parameters prescribed in IS 10500:1991. • Compliance with ESMP shall be reported to Engineer - Incharge every week. Engineer - Incharge shall inspect the labor camp periodically, to ensure compliance of the ESMP.
Sanitation and Sewage System	The Contractor shall ensure that - • The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occur and no pollution to the air, groundwater or adjacent watercourses take place • Separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women • Adequate water supply is to be provided in all toilets and urinals • All toilets in workplaces are with the dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition • Night soil is to be disposed of by putting a layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight. • Adequate health care is to be provided for the workforce during the entire phase.
Waste Disposal	The contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed of hygienically as per the Comprehensive Solid Waste Management Plan approved by the Engineer - Incharge. Unless otherwise arranged by ULB's, the Contractor has to make arrangements for disposal of night soils (human excreta) either by suitably approved by the local medical health or municipal authorities or as directed by Engineer - Incharge as provided by the Contractor.
Stock-yards	• Location for stockyards for construction materials shall be identified at least 1000 m from the watercourse and separated and sufficiently away from the labor camps. • Separate enclosures shall be planned for storing construction materials containing fine particles such that sediment-laden water does not drain into nearby storm water drain & underground sewerage pipes.
Fuel storage and refueling areas	• The Contractor shall ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and

Project Activities	Management Measure
	equipment maintenance, and refueling sites are located at least 500 m from rivers and irrigation canal/ponds • All location and lay-out plans of such sites shall be submitted by the Contractor before their establishment and shall be approved by the Engineer. • In all fuel storage and refueling areas, if located on agriculture land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after completion of such storage and refueling activities. Fuel storage shall be provided with bunds. • The plan for the construction campsite shall also include the process of collection and disposal of spent oil and grease. The collection and disposal methods for the spent oil and grease submitted as part of the construction camp plan should be duly approved by the Engineer - Incharge.
Contractor Demobilization	
Clearing of Construction of Camps & Restoration	• Contractor to prepare site restoration plans for approval by the Engineer. The plan has to be implemented by the contractor before demobilization. • On completion of the works, all temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer. • Residual topsoil shall be distributed on adjoining/proximate barren/rocky areas as identified by the Engineer in a layer of a thickness of 75mm - 150mm.
Redevelopment of Borrow Areas	Redevelopment of borrow areas shall be taken up following the plans approved by the Engineer.
Environmental Enhancement and Special Issues	
Enhancement measures	• Enhancement of all incidental spaces shall be planned and carried out before completion of construction, along the project road. Some of the enhancement measures to be considered along the project roads include avenue tree plantation, restoration of water bodies, providing public amenities, planting of shrubs in medians, rainwater harvesting, adequate storm water drainage, Landscaping at junctions to improve aesthetics, etc.
Roadside Plantation Strategy, Tree Planting & Protection	• The Contractor/identified agency (were specifically identified) shall do the plantation at the median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project. The Contractor/ identified agency shall plant Indigenous plant varieties to the extent possible, guidance from the forest department shall be taken for the same. • Minimum 80 percent survival rate of the saplings shall be acceptable otherwise the Contractor shall replace dead plants at his own cost. The Contractor shall maintain the plantation until they handover the project site to TNRSP. • Giving due protection to the trees that fall in the shoulders /corridor of impact/ trees planted outside clear zone shall be the prime focus during Construction/post-construction. • Re-plantation of at least ten times the number of trees (1:10) cut should be carried out along the project road. Since the major portion of the project road may pass through open lands, planting of trees along the entire stretch of the road is recommended as an enhancement measure, which would also serve as a mechanism to delineate ROW and prevent future encroachments/squatters into

Project Activities	Management Measure
	the right of way, wherever possible. • Growth and survival of trees planted shall be ensured and monitoring is done at least for 3 years. Survival status shall be reported every month to Engineer - Incharge. • The Engineer - Incharge shall inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.
Transplantation	All trees up to 30 cm girth at breast height and naturally occurring medicinal shrubs/bushes/grass clumps within the RoW shall be uprooted mechanically with ball of earth intact for relocation and transplantation at various pre-identified locations such as degraded sites, embankments of road-side water bodies, temples, near-by market places, religious properties, schools and along road corridors for preventing loss of diverse vegetative cover and for reducing growth period.
Flora and Chance found Fauna	• The Contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. • If any wild animal is found near the construction site at any point in time, the Contractor shall immediately upon discovery thereof acquaint the Engineer - Incharge and execute the Engineer's instructions for dealing with the same. • The Engineer-Incharge shall report to the nearby forest office (range office or divisional office) and shall take appropriate steps/ measures if required in consultation with the forest officials.
Sensitive Areas	• The sensitive areas like schools, hospitals are provided with permanent noise barriers before the start of work to minimize the dust and noise impacts due to vehicle movement (during / post-construction). Their effectiveness to be checked during the operation phase. • Construction activities shall be confined within the present available RoW, regularly strict monitoring/supervision should be done to minimize/control air-noise pollution and abatement of dust particles at the minimum level possible using well maintain modern machineries. Crushers, Hot-mix Plants and Batching Plants should be placed at least 10km aerial distance away from the sanctuary boundary.
OPERATION STAGE (Activities to be Carried Out by the TNRSP/Forest Department, GoTN)	
Monitoring and Evaluation of Environmental Mitigation Measures provided in the Project	• The PIU/ TNRSP shall monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project.
Maintenance of Drainage	• PIU/ TNRSP shall ensure that all drains (side drains and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding without damaging the land, properties, spurs and check dams erected to stabilize the course and flow of all such drainage channels. • PIU/ TNRSP shall ensure that all the sediment/oil and grease traps set up at the truck and bus lay bye are cleared once in every three months.
Pollution Monitoring	• The frequency of monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination are to be continued at pre-designated

Project Activities	Management Measure
	locations as identified in the Environmental Monitoring Plan and if necessary, at additional locations for comparative study of pre and post-operation data to ensure further improvement/modification in similar future works. • PIU/TNRSP shall appoint a specific pollution monitoring agency for this purpose.
Atmospheric Pollution	• Ambient air concentrations of various pollutants shall be monitored as envisaged in the Environmental Monitoring Plan at pre-designated locations to compare the levels with the pre-construction data. • Additional data at other locations may be collected as per any site-specific requirement.
Noise Pollution	• Noise pollution shall be monitored as per the Environmental Monitoring Plan at sensitive locations where pre-construction noise data was collected. The functioning of the noise barriers has to be specifically supervised and monitored for further improvement/replication at other affected points if necessary. • Signage indicating 'no horn zones' near sensitive locations shall be maintained and kept clean. Monitoring the effectiveness of the pollution attenuation barriers shall be taken up thrice in the operation period.
Soil Erosion and Monitoring of Borrow Areas	• Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried out before monsoon, during monsoon, and after winter rains to record and monitor the effectiveness of such structures after the completion of project, to evaluate the beneficial effects of each type of activity together with the cost involved.
Avenue Trees	• The PIU/TNRSP with the assistance from Forest Department, GoTN shall do survival monitoring of avenue trees for every quarter.
Road Safety and Maintenance of Assets	• No advertisement/hoardings shall be allowed within the Right of Way limits of the project road. • Regular maintenance and cleaning of assets such as signboards, bus stops, drains, etc. shall be undertaken.

9 Public Consultation/ Focus Group Discussion

Public Consultations were conducted to assess the perception of the people about the proposed project. The stakeholders selected included shop keepers, residents along the road, owners/ workers of local commercial establishments, etc. Issues and concerns of the people about the improvement of the road were discussed including their perception of the project. The consultations were conducted based on the following objectives

- Overall features of the project and asked for the feedback of the people.
- Social and Environmental concerns and suggestion to improve safety and environmental protection

The details of the meetings including consultation photographs are illustrated in the following sections. Few attendance sheets for reference is enclosed in the **Annexure 3**. Consultation with various stakeholders has been done in general as part of a social screening study. Discussion on women's safety and security shall be discussed with women groups, students, educational institution authorities, farmers, etc shall also be consulted and the same shall be presented in the corridor-specific ESIA.

a) SH 222 (Omalur – Mecheri Road)

Date of Consultation	Consultation Location	People perception/demands/suggestion
10/12/2019	Omallur	• People demanded ROB at railway level cross • Footpath may be provided along the built-up locations. • Landowners should get market rate for loss of land (Land value 2 lac/cent.) • Dedicated bus bay and bus stop should be provided at built-up locations to avoid traffic block • Median to be provided at built-up locations • A job may be provided during construction • Proper signage may be provided to avoid accidents
	Panchukalipatti	• Dedicated bus bay and bus stop should be provided at built-up locations • Income restoration program should provide for workers also, especially daily wage laborers of power looms • Proper safety measures may be taken to avoid accidents • Landowners should get market rate for loss of land (Land value 3 -4 lac/cent.) • Child laborers should not be allowed during the construction • Public facilities, like toilets and drinking water, may be provided based on the requirements • People are aware of the road improvement works
	Mecheri	• Participants were not aware of the road widening • Present road conditions are very poor, and the road width is very less. No proper road facilities are available now, it should be included in the new design • Most of the people are working as daily labors and doing small businesses • There are no public toilet facilities or public drinking water facility available • Traffic safety awareness program may be included in the project and all the school students and tractor drivers and bull cart maintaining farmers

b) SH 30 (Attur - Malliyakarai Road)

Date of Consultation	Consultation Location	People perception/demands/suggestion

Date of Consultation	Consultation Location	People perception/demands/suggestion
10/12/2019	Echampatti	• People are aware of the road widening • Provide proper safety measures near the school. • Participants demanded Proper footpath cum drainage • People requested to provide drinking water facility • Provide a median for the roads to avoid accidents • Mainly their livelihood is from agriculture (Paruthi, Cholam), it should be compensated • People demanded Market Value for their land (Land Value Rs.6.5 Lakhs/Cent) • Some participants proposed Bypass for easy traffic
	Thandavaraya-puram.	• Few participants are aware of the proposed road widening. • People demanded bypass or realignment. • People requested to construct bus bays outside junction. • People demanded junction improvement. • Landowners demanded market value for loss of land (Land value Rs.2000/Sq.feet) • Participants requested to construct a Public comfort station. • Participants requested to reduce land acquisition for road widening.
	Pukkampatti	• People proposed Railway Over Bridge to reduce traffic issues. • Agriculture is the main income of the people; hence proper compensation should provide for loss of land. • Participants requested to construct footpath and drainage. • Provide proper design in curve areas to avoid accidents. • They demanded proper land value (Land Value Rs 1.5 Lakhs/Cent).

c) SH 15 (Ooty – Kothagiri – Mettupalayam – Sathy – Gobi – Erode Road)

Date of Consultation	Consultation Location	People perception/demands/suggestion
11/12/2019	Kongupalayam	• The accident-prone area due to no speed breakers, proper signages may be provided. • No pedestrian crossing in the built-up locations, proper pedestrian crossing marking with signal lighting may be provided. • Bus bay and bus stop should be provided • Median to be provided at built-up locations • Proper signage may be provided to avoid accidents. • Power loom, agriculture is their main source of income. • No public usage facilities like toilets or drinking water available. • Participants are aware of road widening.
	Mamarathupalayam	• Proper safety measures may be taken to avoid accidents • Public facilities, like toilets and drinking water, may be provided based on the requirements. • People are not aware of the improvement. • Sakthi Spices Company has got its factory and hospital for differently-abled people in this hamlet. Around 200 differently-abled workers and 100 differently-abled patients are using this bus stop daily, where no facilities are available. A bus waiting shed suitable to differently-abled persons may be provided at this location. • Streetlights and signboards are required
	Bharathi Nagar.	• Participants are aware of road widening. • Present road conditions are very poor, there are no speed breakers or pedestrian crossing • This hamlet is an accident-prone area. • Proper measures may be taken to avoid accidents.

d) MDR 108 (Erode – Chennimalai Road)

Date of Consultation	Consultation Location	People perception/demands/suggestion
11/12/2019	Vellode	• People demanded compulsory road widening • Participants demanded the market rate for the

Date of Consultation	Consultation Location	People perception/demands/suggestion
		land (Land Value 2.5 Lakhs/Cent) • Provide speed breakers and night reflectors to avoid accidents • Provide footpath and proper drainage • Participants requested to construct a Pilgrim Shelter • People requested to construct toilets for the public.
	Chennimalai	• Participants demanded proper drainage and footpath. • People demanded junction improvement. • Landowners demanded market value for loss of land (Land value 5 lakhs/cent.) • Public facilities, like toilets and drinking water, may be provided based on the requirements. • Few people are aware of the improvement • Proper signals required in the main junctions, School area, Market and Temple locations.
	KK Nagar	• Participants are not aware of the proposed road improvements • People demanded Railway over Bridge to avoid Traffic issues. • They requested for bus shelter, proper footpath, and drainage. • The participants not known about child labor. • No health centers were available in that location. • They demanded proper land value (Land Value Rs 2000/ Square feet). • In curve location provide suitable design to avoid accidents.

e) 116 (Kanchipuram-Cheyyar Road)

Date of Consultation	Consultation Location	People perception/demands/suggestion
16/12/2019	Sevilimedu	• People are aware of the road widening • Participants proposed Bypass to avoid heavy traffic.

Date of Consultation	Consultation Location	People perception/demands/suggestion
		• This road is mainly accident-prone zone, requested for safety measures. • The public requested for realignment.
	Dusi	• People are not aware of road widening. • They requested to provide Bus shelter, Proper drainage, and footpath. • They demanded Bypass to avoid traffic issues. • They proposed to construct Public Toilet • They demanded proper land value (Land Value Rs. 8000 /Cent).
	Mamandur	• Few people are aware of road widening. • They Demanded Realignment. • They suggested providing a crossing facility to avoid the accident. • There is no child labor reported by the participants. • They suggested constructing public toilets, Bus shelters. • Participants demanded for market rate(Land Value Rs.2000/ Sq.feet)
	Vandavasi Bypass	• Participants are not aware of the road widening and bypass construction. • Majority of the people are doing Pai Business • People demanded Market value for land (Land Value Rs.3000/-Sq.ft). • There is no child labor reported. Children are attending school. • Majority of the people are working in SIPCOT (Small Scale Industries)

f) SH 4 (Arcot – Arni Road)

Date of Consultation	Consultation Location	People perception/demands/suggestion
17/12/2019	Arcot	• Few people are aware of the proposed road widening. • They demanded realignment. • Their main source of income is from agriculture, requested for good compensation

Date of Consultation	Consultation Location	People perception/demands/suggestion
		• This zone is mainly accident-prone area, hence proper safety measures may be implemented. • They demanded present land value for their land(Land Value Rs.7000/Sq.feet) • There is no child labor reported in this area.
	Thimiri	• People demanded bypass to avoid traffic issues. • Agriculture is their main source of income, requested for good compensation • Around 26 Rice mills are there in this locality. The majority of the people are working in these rice mills. Bus bays and bus shelter may be provided. • People work in nearby quarries • The people requested to improve the facilities of public toilets. • They demanded proper land value (Land Value Rs. 8000 /Cent)
	Thamarai-pakkam	• This is mainly an accident-prone area; proper safety measures may be provided. • People recommended for bypass and road widening • Their main source of income is from Agriculture, asked for enough compensation. • They are facing water scarcity, requested to improve drinking water facilities. • There are no nearby health facilities. • People suggested Bus Bays, footpath, drainage, and Public Toilet.
	Arani	• Few people are aware of the project • There is no Child Labour reported by the participants. Children's are attending school • Rice and Silk is their main source of Income • Due to the arrival of the new Bus stand and railway station, they requested to construct a new Public comfort station • Participants demanded Market value for their land

g) SH 139 (Ariyalur – Reddipalayam Road)

Date of	Consultation	People perception/demands/suggestion

Consultation	Location	
18/12/2019	Ariyalur	• Accident prone area due to no speed breakers • Demanded in Drainage and Foot path. • Provision for parking facilities for Auto riksha and Car • Proper signage may be provided to avoid accidents. • There are 7 Cement factories located in this project road, due to this there is a heavy truck traffic and causes accidents • Large population of migrant labours is settled in this area. • These cement factories does not provide any employment for the local peoples.
	Valaza Nagar	• Dedicated bus bay and bus stops should be provided • The project road is an accident prone area • Public facilities, like toilets and drinking water may be provided based on the requirements.
	Venkata krishnapuram	• Accident prone area • There are no public toilet facilities • Parking facilities are required • Demanded for Bus stops
	Asthina puram	• People are aware of road widening • This road is an accident prone zone. • Demanded in Drainage and Foot path • They are asking common facilities like Toilets and Bathroom
	Reddi palayam	• People demanded only two lane road. • They requested to provide Bus shelter, Proper drainage facility and footpath. • Requested for Public Toilet • Accidents are happening more frequently

Outcome of the FGD's: Consultations were done at socially sensitive locations with various stakeholders during the screening survey. The consulted stakeholders include owners of the residential and commercial buildings, tenants and employees of the commercial buildings, auto rickshaw and taxi drivers, students, elected representatives' members of CBO/NGOs, working women and farmers. Safety was the major issue discussed in all the meetings. People requested to provide the signboards, zebra line at settlement areas, school zones, near hospitals and factory locations and speed breakers at start and end locations of settlement areas. The public opined that proper traffic safety orientation

programs should organise for taxi drivers, students and particularly the cattle cart users, most of the cattle carts do not fix the reflector and its course for accidents.

People suggested constructing noise barriers at school locations, hospitals, and other such sensitive locations. Auto and taxi drivers demanded parking facility for them and bus bays should be provided to serve the commuters as it will reduce traffic blocks and accidents. Tenants and employees of the commercial establishments demanded resettlement and rehabilitation assistance and enough time to resettle after received the compensation. Tenants of the commercial buildings requested to segregate the interior decoration cost in the building valuation estimate. The landowners demanded market rate for loss of land. The public requested drinking water facilities, toilets, etc as part of the project. Few farmers were also consulted, and they also demanded market value for their land time for harvesting the existing crops. The major points raised by the farmers are, if a perennial well to be acquired by the project, TNRSP should provide compensation to dig the well till they get the same quality (water availability) of well, as it can be possible only after multiple efforts. Hence while estimating the compensation this must keep in mind. The discussed points have been shared with the engineering/design team to analyse the possibilities of incorporating the suggestions into the proposed road designs/ road furniture and road safety measures. Project corridor wise number of participants are given in the following table

Project Corridors	FGD Locations	Number of Participants		
		Male	Female	Total
Omalur to Mecheri Road (SH 222)	Omallur	34	2	36
	Panchukalipatti	47	7	54
	Mecheri	8	0	8
	Echampatti	8	4	12
	Thandavarayapuram	22	1	23
	Pukkampatti	9	1	10
Chithod - Erode Road (SH 15)	Kongupalayam	26	3	29
	Mamarathupalayam	27	4	31
	Bharathi Nagar	9	23	32
Kanchipuram to Cheyyar Road (SH 116)	Dusi	16	10	16
	Mamandur.	14	5	19
	Vandavasi Bypass	7	0	7
Eroad to Chennimalai (MDR 108)	Vellode	28	2	30
	Chennimalai	28	1	29
	KK Nagar	24	6	30
Ariyalur to Reddipalayam Road (SH 139)	Ariyalur	18	2	20
	Valaza Nagar	12	0	12
	Venkatakrishnapuram	16	0	16
	Asthinapuram	21	0	21
	Reddipalayam	17	0	17
Arcot to Arani Road (SH 4)	Arcot	8	0	8
	Thimiri	11	0	11
	Thamaraipakkam	12	0	12
	Arani	15	0	15

Source: FGD Survey, Feedback consultants, 2019

Specific consultations with women, village leaders along the roadside and those affected by wet lands in Vandavasi bypass are not covered under the conducted FGD's. It shall be

conducted as part of the corridor specific ESIA study. A**ctions have been taken on the concerns /suggestions of the public**

The suggestion/concerns of public such as the possibility of a bypass to avoid impacts in built-up areas, provision of basic amenities, safety measures, livelihood impacts, need for additional bus bays, etc were discussed with the design team and it would be addressed in the detailed design/ DPR. Concerns on fair compensation for loss of assets and job opportunities shall be addressed in the corridor -specific detailed ESIA.

10 Implementation of ESMP and RAP

(i) **Implementation of ESMP***:* The ESMP given in the bid document will be implemented by the Contractor (Environmental and Safety Engineer), he will make sure that all the project related clearance including the NoC/ Permissions from the competent authority is obtained before the start of the construction works. He will be responsible for conducting the environmental monitoring (as per the environmental monitoring plan) and the preparation and submission of the monthly ESMP report to the Construction Supervision Consultant (CSC). The CSC (Environmental Officer) will verify the project related clearances (including the NoC/ permissions) and he will review the environmental monitoring outcomes, as well as the monthly ESMP reports and guide/ advise the contractor in implementing the ESMP. The CSC (Environmental Officer) will submit the revised monthly ESMP report to the PIU. The Environmental cell in the PIU will review the monthly ESMP reports and it will be consolidated every quarter and shared with the World Bank for review and disclosure. As per the assessment, the existing environmental cell in the TNRSP is observed to be well structured and well-functioning, it is evident from the on-going TNRSP-II. Hence, it is suggested to adopt the same institutional arrangement for ESMP implementing for roads under additional financing.

(ii) **RAP Implementation**: The overall responsibility lies with the TNRSP for implementing the RAP. The Social Development Unit (SDU) under the supervision of the PIU, has been designated to implementing the RAP with the assistance from the Land Acquisition Rehabilitation and Resettlement Unit (LARRU). To support the LARRU, the RAP implementation Support Consultant (NGO's) shall be appointed, the roles of the Support Consultant is to verify Project Affected Persons (PAPs) list and inventory of loss of assets. Based on the outcome, a microplans (inventory of lost assets, completely collected PAP information, and impact on community assets, PAP payments and relocation progress etc.) containing details of PAPs eligible and ineligible to receive R&R assistance shall be prepared and shared with the LARRU. The submitted microplans shall be maintained through Management Information System (MIS). The support consultant and LARRU shall identify the suitable R&R sites in consultation with the PAP's. The land suitability shall be further scrutinised by the technical team. Bank account for the PAP's shall be generated for receiving compensation of LA & RR assistance as per the Entitlement Matrix (R&R Policy), the vulnerable PAP's/ family members shall be chosen for skill-based training to improve their livelihood and employment opportunities

11 Grievance Redressal Committee (GRC)

A well-functioning GRC system is in place in TNRSP -II, which has been modified over the years of implementation and it is capable to handle the grievances of PAPs effectively. The PAP (Project affected People)/ Displace people, with the assistance from the Implementation Consultants (NGO's) shall submit the grievance to the first level of the

GRC headed by the Retired District Revenue Officer (DRO), the submitted grievance shall be scrutinised (based on the facts and figures) and if found inappropriate upon further investigation, the grievance shall be rejected and it will be communicated to the complainant. If the grievance is accepted, it shall be redressed in 3 weeks and a written communication shall be sent to the complainant. A compliance register shall be maintained at divisional level with details of the complaint lodged, date of personal hearing, action taken and date of communication sent to the complainant.

If the complainant is still not satisfied with the outcome from the first level, he/she can approach the Project Director, TNRSP, on acceptance of the grievance it shall be redressed in 3 weeks and a written communication shall be sent to the complainant. If the complainant is still not satisfied with the outcome from the second level, he/she can approach the jurisdictional LARR Authority. The complainant can access the appropriate LARR Authority at any time and not necessarily go through GRC.

As per the experience from the TNRSP-II, the GRC committee has been functioning extremely well and there are no cases that have reached the jurisdictional LARR Authority. However, based on the consultations had with the committee members, the information dissemination on the GRC setup and its roles and responsibilities are not known to many of them in the project area. Hence, it is suggested to increase the role/ activity of the Implementing Consultants (NGO's) to reach the project areas and to explain about the GRC mechanism. It shall be done during the public consultations, organising workshops and by circulating the project information pamphlets/ leaflets.

12 Environmental Monitoring Plan

To ensure the effective implementation of the EMP, it is essential that an effective monitoring program has to be designed and carried out. For this package, the monitoring plan is based on the following objectives.

- To evaluate the performance of mitigation measures proposed in the ESMP;
- To suggest improvements in the management plans, if required;
- To satisfy the statutory and community obligations; and,
- To provide feedback on the adequacy of Environmental Impact Assessment

The monitoring program has a monitoring plan for all performance indicators and reporting systems.

12.1 Performance Indicators

The performance indicators are based on the physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations. The Performance Indicators are evaluated under three heads as:

- Environmental condition indicators to determine the efficacy of environmental management measures in control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures
- Operational performance indicators have also been devised to determine the efficacy and utility of the mitigation/enhancement designs proposed

The performance Indicators and monitoring plans prepared for project Implementation are presented in the following table.

Table 24: Performance Indicators for Project Implementation

Sl.no	Performance Indicators	Indicators	Parameters
1.	Environmental Condition Indicators (to be monitored Quarterly (till the completion of the project))	Air Quality	SO_2, NO_x, RPM, SPM, O_3, Pb, CO, NH_3, C_6H_6, BaP, As and Ni (As per AAQ Standard)
		Noise Levels	Day and night-time noise levels on dB (A) scale (Ambient Air Quality Standards in respect of Noise)
		Water Quality	As per IS 10500 for Groundwater and IS 2296 for surface water
		Soil Quality	Monitoring of Pb, SAR and Oil & Grease
2.	Environmental Management Indicators (to be monitored bimonthly (till the completion of the project)	Construction Camps	Location of construction camps have to be identified and parameters indicative of the environment in the area has to be reported
		Borrow Areas	The location of borrow areas has to be identified and parameters indicative of the environment in the area have to be reported.
		Tree Cutting	Progress of tree removal marked for cutting is to be reported
		Tree Plantation	Progress of measures suggested as part of the Strategy is to be reported
3.	Management & Operational Performance Indicators (to be monitored monthly (till the completion of the project)	Survival Rate of Trees	The number of trees surviving during each visit will be compared with the number of saplings planted
		Status Regarding Rehabilitation of Borrow Areas	The PU will undertake site visits to determine how many borrow areas have been rehabilitated in line with the landowner's request and to their satisfaction.
		Soil Erosion	Visual monitoring and operation inspection of embankments will be carried out once in three months.

12.2 Reporting System

Reporting system suggested for the package - 6 roads operate at two levels as:

- Reporting for environmental condition indicators and environmental management indicators (except tree cutting indicator)
- Reporting for operational performance indicators at the PIU level

Contractor and Engineer - in charge operate the reporting system for environmental conditions and environmental management indicators (except tree cutting). The Environmental Management Cell of PIU will operate the reporting system for environmental management tree cutting indicators and operational performance indicators. The PIU will set the targets for each activity envisaged in the ESMP beforehand and all reports will be against these targets.

The contractor will report to the Engineer - in-charge of the progress of the implementation of environmental conditions and management measures as per the ESMP. The Engineer- in-charge will in turn report to the PIU every quarter.

13 ESMP Budget

The ESMP budget has been estimated under 3 heads and detailed in the project road-specific ESIA.

- Environmental management measures to be abided by the Contractor under the civil cost. The management measures indicated in the civil cost includes rainwater harvesting structures, silt fencing, barricading, oil interceptors, enhancement of community and cultural properties, restoration of surface water bodies, safety measures (including road user safety and construction safety), etc.,
- Monitoring of environmental attributes during project construction activity and operation activity
- Resettlement Action Plan (RAP) budget for the displaced people including Land acquisition, structure compensation, loss of livelihood and other R&R assistances as indicated in the RAP

14 Conclusion and Recommendations

The environmental and the social impact assessment has been conducted as per the approach/ methodology for conducting ESIA study for all the seven project corridors. All the potential impacts were identified in relation to pre-construction, construction, and operation phases. Social impact assessment study has done within the proposed corridor (based on the cross section approved for the project). Except Omalur – Mecheri Road (SH 222), where a realignment section has been proposed for a length of 1.3km, all other project corridors are proposed for widening and strengthening in the existing alignment and hence the anticipated environmental and social impacts are moderate. For the corridors (i. Malliyakarai – Attur Road (SH 30), and ii. Erode – Chennimalai Road (MDR 108)) proposed with 2 lane configuration shall not have much environmental and social impacts due to the availability of the Right of Way (RoW) in comparison with the project corridors (i. Omalur – Mecheri Road (SH 222), ii. Chithode – Erode Road (SH 15), iii. Kanchipuram – Cheyyar Road (SH 116), vi. Ariyalur – Reddipalayam (SH 139) and v. Arcot – Arni (SH 4)) proposed with 4 lane configuration, where land acquisition, R&R Issues, tree cutting and loss of water bodies are foreseen.

The proposed project interventions shall not attract Environmental Clearance (EC) from the SEIAA. However, due to the presence of the Vellode Bird Sanctuary at km 13/500, which is located within 2km radius from the project corridor (Erode to Chennimalai Road (MDR 108), shall mandate Wildlife clearance from National Board for Wildlife (NBWL). Other than these, the project related clearances, NoC/permissions as listed in the Table 6 have to be obtained before commencement of the construction works. From the baseline environmental study, it is evident that the project areas have a healthy environment with respect to the air quality, noise quality and water quality. Topography is moderately flat and seismicity is Zone II (Low Damage Risk Zone). However, as per the CGWB information on the groundwater status, the project areas, Salem and Ranipet are denoted as over exploited areas, Erode and Thiruvanamali are denoted as critical and semi critical areas. Hence the project corridors (SH 222, SH 30, MDR 108, SH 15, SH 116 and SH 4), falling under these project areas shall be provided with additional rainwater harvesting structures for replenishing groundwater. As an enhancement measure, the lakes, ponds and tanks along the project corridors shall be desilted/ deepened and protection measures shall be provided.

The social survey shows that 3738 structures/assets are likely to be affected due to this project, of these 1074 are residential buildings, 1535 are commercial buildings and 503 are

residential cum commercial buildings. Tentatively 77.4 Ha of private land to be acquired for this project. As per the analysis, maximum number of the constructed structures, which are likely to be impacted within the corridor of impact, are Pucca structures 2170 (58.1%), followed by semi Pucca structures 971 (260%). 6.5 percent buildings are kutcha/temporary in nature and remaining 9.7% are falling in other category (lean to roof, portion of compound wall, water tap, toilet, bathrooms etc.). The project causes significant impact to 1535 commercial buildings resulting in loss of livelihood to about 6245 households (HHs). The 6245 HHs comprise 1535 business owners, 503 residential cum commercial owners, 3473 tenants and 2772 employees.

Focus Group Discussions (FGD's) were conducted to assess the perception of the people about the proposed project. The stakeholders selected included shop keepers, residents along the road, owners/ workers of local commercial establishments etc. The outcome of the consultations depicts the requirement for the road safety measures, road furniture's (including street lights, additional bus bays, signage's, speed breaker etc,). The land compensation has to be provided as per the market price, and some of the communities (Echampatti, and Thandavarayapuram villages) located in the Attur - Malliyakarai Road (SH 30), Dusi village located in the Kanchipuram-Cheyyar Road (SH 116) and Thimiri, Thamaraipakkam villages located in the Arcot – Arni Road (SH 4) have requested for the bypass options. The views expressed by the communities will be shared with the engineering /design team to study the possibilities and further to include it in the proposed designs.

In view of the environmental Impact assessment, there will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on the project corridors (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects, disturbance to the residents, businesses, safety risk to workers, public and nearby buildings due to road excavation works, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts that are likely to arise during the road construction works in the settlement areas, and there are well developed methods of mitigation that are suggested in the ESMP. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported by the contractor to the CSC/PIU. Final ESMP will include risk mitigation measures related to the safety of women agricultural labourers, school-going girls, women accessing hospitals and other relevant stakeholders.

A well-functioning GRC system is in place in TNRSP -II, which has been modified over the years of implementation and it is capable to handle the grievances of PAPs effectively. Consultant has also reviewed the prevailing Entitlement Matrix of TNRSP and found that all the category of impacts has been covered in the EM, hence no further revisions would be required at this stage. The project's grievance redress mechanism will provide the communities with a platform to redress their grievances, describes the formal channels, time frame, and mechanisms for resolving complaints.

Out of the seven roads the preliminary design has already been done for four roads. The technical consultant will review the alignment and finalise in consultation with TNRSP field implementation units at the earliest. The social team of technical consultant will arrange public consultation to disseminate the project alignment and entitlement matrix.

The social team of technical consultant shall carryout 100% census on structure/assets affected households. Socio economic survey will limit to significantly affected households. Based on the census Resettlement Action Plan shall be developed for each project road

The prepared ESMP will assist the Contractor, CSC, and the PIU in mitigating the environmental and social impacts, and guide them in the environmentally sound execution of the proposed project. A copy of the updated ESMP shall be kept on-site during the construction period at all times. The ESMP shall be included in the bidding document along with appropriate contractual clauses for safeguarding the environment during the project construction and operation (maintenance period). As per the World Bank policy requirements, the prepared safeguard documents shall be disclosed in the World Bank website as well as the TNRSP website.

Annexure

Annexure - 1

Comparison of Alignment Alternatives for Omalur Realignment

Sl. No.	Description	Option - I	Option - II	Option - III
1	Starting	existing km 2.38 on SH-86	existing km 2.37 on SH-86	Existing km 186.500 on NH-44
2	Ending	Existing km 0.95 of SH-222	Existing km 1.35 of SH-222	Existing km 2.55 of SH-222
3	Length of Bypass	**Apprx. 1.25 Km**	**Apprx. 1.60 Km**	**Apprx. 3.05 Km**
4	Length of road utilising existing RoW	**Nil**	**Nil**	**Nil**
5	Total Length of Proposed Alternative Option	**Apprx. 1.25 Km**	**Apprx. 1.60 Km**	**Apprx. 3.05 Km**
6	Speed	65 & 80 kmph	80 kmph	100 kmph
7	Existing land use pattern through proposed alignment	Agricultural Land and Built up land	Agricultural Land and Built up land	Agricultural Land and Partially Dry land
8	No. of Structures	Major Bridge - 0 Minor Bridge - 0 Box Culvert - 4 Pipe Culvert - 0 ROB - 1 VUP/VOP - 1	Major Bridge - 0 Minor Bridge cum VUP- 1 Box Culvert - 4 Pipe Culvert - 0 ROB - 1 VUP/VOP - 1	Major Bridge cum VUP - 1 Minor Bridge - 0 Box Culvert - 15 Pipe Culvert - 0 ROB - 1 VUP/VOP - 1
		Total no of Structures = 6 no's	**Total no of Structures = 7 no's**	**Total no of Structures = 18 no's**
9	Proposed ROW	45 & 50 m(At ROB Approach)	45 & 50 m(At ROB Approach)	45 & 50 m(At ROB Approach)
10	Existing RoW	-	-	-
11	Total Additional land required in Ha	6.74 Hec	8.47 Hec	15.65 Hec
12	No of Structure affected	22 Nos	37 Nos	20 Nos
13	Proposed Improvement as per IRC SP 84 2014 four lane Manual	4 lane divided carriageway	4 lane divided carriageway	4 lane divided carriageway
14	LA & R&R Cost	4.47 Cr	6.09 Cr	8.82 Cr
15	Construction Civil cost	37.18 Cr	44.42 Cr	68.73 Cr

Comparison of Alignment Alternatives for Omalur Realignment

Sl. No.	Description	Option - I	Option - II	Option - III
16	Total Project Cost	**41.64 Cr**	**50.51 Cr**	**77.55 Cr**
17	Merits	1. Provides better connectivity and smooth passage to through traffic and trucks. 2. Length of Alignment is comparatively less, Extent of Land Acquisition is less 3. Project cost is reasonably less 4. ROB is proposed across railway line which eases the movement of traffic 5. Environmental impact due to Noise and air pollution will be less compared to other options	1. Provides better connectivity and smooth passage to through traffic and trucks. 2. ROB is proposed across railway line which eases the movement of traffic 3. Environmental impact due to Noise and air pollution will be less compared to other options	1. Provides better connectivity and smooth passage to through traffic and trucks. 2. ROB is proposed across railway line which eases the movement of traffic 3. Direct Connectivity to NH traffic, Thus through traffic is avoided entering Omalur town
18	Demerits	1. As the alignment passes through highly cultivated farms and through built up, involves acquisition of large extent of highly fertile farm land.	1. As the alignment passes through highly cultivated farms involves acquisition of large extent of highly fertile farm land. 2. More number of Buildings are getting Affected compared to other Options 3. As the proposed road crosses a Tank, Minor bridge has to be proposed 4. Project Cost is more compared to option - I 5. Getting clearance from Irrigation department will be difficult as alignment is passing through ponds. 7. Runs close to Grave Yard	1. As the alignment passes through highly cultivated farms involves acquisition of large extent of highly fertile farm land. 2. Length of Alignment is more compared to other two options 3. Total Project cost is high compared to other options 4. As this option connects NH-44 with project road, the traffic from and to Omalur has to use the existing road from start till end of the realignment (i.e., Km.0.000 to Km.2.550 of SH-222) and has to cross railway level crossing.

Annexure - 2

List of Sensitive Receptors

(i) Omalur to Mecheri Road (SH 222)

Sl.no	Location / Existing km	Description	Side
1.	3/300	Government Primary Health Center	RHS
2.	3/400	Government School	RHS
3.	3/810	Government School	RHS
4.	3/810	Government Veterinary Hospital	LHS
5.	4/200	Nalam Hospital	RHS
6.	4/620	South Indian Matriculation High Secondary School	LHS
7.	9/000	Sri Balamurugan College (Arts and Science College)	RHS

(ii) Malliyakarai to Attur Road (SH 30)

Sl.no	Location / Existing km	Description	Side
1.	81/070	Government Veterinary Hospital	LHS
2.	81/970	Rasi Metric Higher Secondary School	LHS
3.	82/950	Government School	RHS
4.	88/450	First Aid Medical Center	LHS

(iii) Chithode to Erode Road (SH 15)

Sl.no	Location / Existing km	Description	Side
1.	153/450	Government Veterinary Hospital	LHS
2.	154/240	Government ITI College	RHS
3.	155/200	Government School	RHS
4.	156/700	Erode Hindu Kalvi Nilayam School	RHS
5.	159/520	SR Hospital	RHS
6.	160/070	CN College	RHS
7.	160/420	Sree Janani Nursery and Primary School	LHS
8.	160/450	Government Veterinary Hospital	RHS
9.	160/940	Machinery School	RHS

(iv) Kanchipuram to Cheyyar Road (SH 116)

Sl.no	Location / Existing km	Description	Side
1.	3/150	Private Hospital	LHS
2.	6/400	Sangford School	LHS
3.	7/440	Government High School	RHS
4.	10/350	Government Hospital	LHS
5.	10/420	Government High School	LHS
6.	10/810	Sri Annai Hospital	LHS
7.	11/510	Government Veterinary Hospital	RHS
8.	12/400	Private Hospital	LHS

(v) Erode to Chennimalai Road (MDR 108)

Sl.no	Location / Existing km	Description	Side
1.	2/100	Erode Government ITI College	RHS
2.	3/390	Joseph Hospital	LHS
3.	4/690	Private College	LHS
4.	5/350	Indian Public School	LHS
5.	13/340	Public Health Center	RHS
6.	13/540	Government Higher Secondary School	LHS
7.	14/935	Vivekanantha Matriculation Higher Secondary School	LHS
8.	15/660	Nursing School	LHS
9.	19/930	M.P Nachimuthu M Jaganathan Engineering College	LHS
10.	21/530	Kongu Vellalar Matriculation Higher Secondary School	LHS

(vi)Ariyalur to Reddipalayam Road (SH 139)

Sl.no	Location / Existing km	Description	Side
1.	1/850	KVS Hospital	LHS
2.	2/020	Government School	LHS
3.	5/900	Government School	LHS
4.	6/300	Government School	RHS
5.	7/780	Government School	RHS
6.	9/950	Aditya Birla Public School	RHS

(vii) Arcot to Arni Road (SH 4)

Sl.no	Location / Existing km	Description	Side
1.	3/330	Sain Pio Matriculation School	LHS
2.	5/950	Arcot Sri Mahalakshmi Women's College	LHS
3.	5/950	GV Annai Multispecialty Hospital	RHS
4.	8/480	Private School	LHS
5.	9/420	Government School	RHS
6.	10/020	Private School	RHS
7.	10/090	Government Hospital	LHS
8.	13/650	Private School	LHS
9.	14/990	Government School	RHS
10.	17/750	Arignar Anna Higher Secondary School	RHS
11.	21/870	Private School	RHS
12.	22/285	MGR Chockalingam Arts College	RHS
13.	22/700	ACS Arts and Science College	RHS
14.	22/980	College	RHS
15.	23/460	DR MGR Polytechnic College	RHS
16.	24/000	ACS Metric Higher Secondary School	RHS

Annexure - 3

Detailed Project Report for various road improvement works under Tamil Nadu Road Sector Project – II (TNRSP II) Contract: PPC 06.

Public Consultation/ Focus Group Discussion

Attendance Sheet

Venue: Date& Time:

Sl. No.	Name, Address & Phone No.	Gender	Signature
1	[illegible]	M	
2.	S. Murugan	M	
3.	C. Balamurugan 9194678910	M	
4.	G. Thanikachalam 8870305202	M	
5.	S. Kumarashan 6385528008	M	
6.	R. Prakash 8754941192	M	
7.	K. Dharamaraj 9443661066	M	
8.	V. Vijay Kumar 9380937735	M	
9.	A. Prakash 9952594316	M.	
10.	N. Balasubramani 9543515519	M	
11.	G.K.S. Kamaraj 9003653625	M	
12.	G.K. Sivasakthivel 9944719225	M	
13.	V. Kalavathi 09943429125	F	
14.	Daliyamal	F	
15.	Geeva 9626516923	F	
16.	S. Kanagavalli 9626516923	F	S. Kanagavalli
17.	Malika		
18.	Poongodi 7904448576		

Detailed Project Report for various road improvement works under Tamil Nadu Road Sector Project – II (TNRSP II) Contract: PPC 06.

Public Consultation/ Focus Group Discussion

Attendance Sheet

Venue: Sevilimedu Date& Time: 16-12-2019

Sl. No.	Name, Address & Phone No.	Gender	Signature
19.	L. [illegible] 7904[illegible]	M	
20.	Andal	F	
21.	Ethiraj 9750524794	F	
22.	G. Ponnusamy 9952341100	M	
23	P. Venkatesan	M	
24.	Ganiki	F	
25	Lakshmi 8220896669	F	

Detailed Project Report for various road improvement works under Tamil Nadu Road Sector Project – II (TNRSP II) Contract: PPC 06.

Public Consultation/ Focus Group Discussion

Attendance Sheet

Venue: Mamandur Date& Time: 16-12-2019

Sl. No.	Name, Address & Phone No.	Gender	Signature
1.	D. Kumar 7200262017	M	D. Kumar
2.	P. Thirumeni 8870713176	M	P. Thirumeni
3.	Sivakumar 9965205885	M	
4.	Muniyan 9626339293	M	M.
5.	Natrajan	M	
6.	Saravana Sudhan 9787088570	M	
7.	B. Jagadeesh 6379[illegible]4386	M	B.
8.	G. Narayanasamy 8838048005	M	G.
9.	L. Arasakumar 6369081871	M	L.
10.	Narayanalal 9444815043	M	S. Nanulal
11.	Dasaraj 9655708413	M	
12.	Srinivasan 7601827259	M	R.
13	Ghandhimathi 9[illegible]5595582	F	
14.	Lakshmi 9585690511	F	V. Lakshmi
15.	Kavya 9943212092	F	Kavya
16.	Manikandan 9597167605	M	
17.	S. Elayaraja 9626210473	M	

Detailed Project Report for various road improvement works under Tamil Nadu Road Sector Project – II (TNRSP II) Contract: PPC 06.

Public Consultation/ Focus Group Discussion

Attendance Sheet

Venue: Dosi

Date& Time: 16-11-20

Sl. No.	Name, Address & Phone No.	Gender	Signature
1.	P. Elangovan 9789977546 VAO.	M.	
2.	V. Gopal 9751236235	M	
3.	N. Narayanan 9943671445	M	
4.	A. Kesavan 9655491363	M	
5.	G. Kaliyappan	M	
6.	C. Murugaraj 9943587705	M	
7.	C. Varatharaj 9626079770	M	
8.	M. Ponnaiselvam 8270338842	M	
9.	S. Nagarathan	M	
10.	M. Dhadabani	M	
11.	Perumal 9786134381	M	
12.	E. Selvam 9677406442	M	
13.	D. Ramamoorthi 8148213690	M	
14	M.T. Livekanandan 9843433424	M	

Detailed Project Report for various road improvement works under Tamil Nadu Road Sector Project – II (TNRSP II) Contract: PPC 06.

Public Consultation/ Focus Group Discussion

Attendance Sheet

Venue: [illegible] Date& Time: 16-12-2019 / 1

Sl. No.	Name, Address & Phone No.	Gender	Signature
1.	[illegible] 178[illegible]2671	M	[illegible]
2.	Gunasekaran 7845720111	M	R. Gunasekaran.
3.	ARJUNAN 9003311174	M	[illegible]
4.	Rajamohamed 9487233620	M	A. [illegible]
5.	V. [illegible] 9488874986	M	S. [illegible]
6.	S. Kudhar 9994262416	M	S. Kudhar
7.	E. Manikandan 9443401955	M	E. [illegible]