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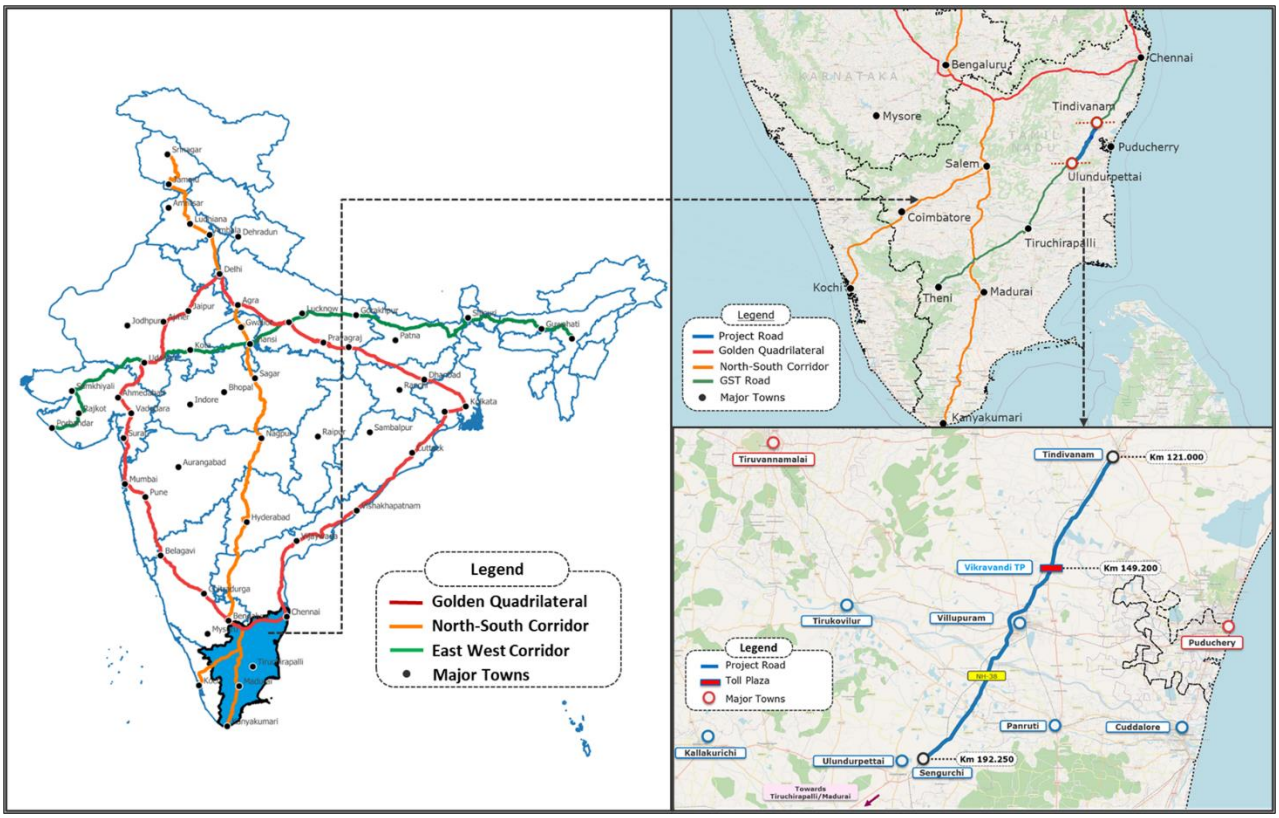
TRAFFIC STUDY FOR TINDIVANAM-ULUNDURPET SECTION OF NH-45 IN THE STATE OF TAMIL NADU



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ABBREVIATIONS

$/US$/USD	United States Dollar
2A	2 Axle Truck
3A	3 Axle Truck
AADT	Annual Average Daily Traffic
ADB	Asian Development Bank
BIA	Broad Influence Area
BOT	Build, Operate & Transfer
CJV	Car/Jeep/Van
CSO	Central Statistical Organisation
CKIC	Chennai-Kanyakumari Industrial Corridor
CAGR	Compounded Annual Growth Rate
CA	Concession Agreement
COVID	Corona Virus Disease
DPIIT	Department for Promotion of Industry and Internal Trade
DPR	Detailed Project Report
ECEC	East Coast Economic Corridor
EI	Economic Indicator
ETBPNMTPL	Ennore – Thiruvallur – Bengaluru – Puducherry – Nagapattinam – Madurai – Tuticorin Pipeline Project
FMCG	Fast Moving Consumer Goods
FY	Financial Year
FDI	Foreign Direct Investment
GST	Goods & Services Tax
GoI	Government of India
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
GVW	Gross Vehicle Weight
IIA	Immediate Influence Area
IOCL	Indian Oil Corporation Ltd
IRC	Indian Roads Congress
₹/Rs	Indian Rupees
IT	Information Technology
LCV	Light Commercial Vehicle
LMV	Light Motor Vehicle
LNG	Liquified Natural Gas

MMSCMD	Million Metric Standard Cubic Meters per Day of Gas
MBus	Mini-Bus
MLCV	Mini Light Commercial Vehicle
MAV	Multi Axle Vehicle
NH	National highway
NHAI	National Highway Authority of India
NHDP	National Highway Development Programme
ONGC	Oil and natural Gas Corporation
OD	Origin & Destination
PCU	Passenger Car Unit
%	Percentage
PIA	Project Influence Area
PR	Project Road
RBI	Reserve Bank of India
SC Bus	School Bus
SEZ	Special Economic Zone
SPV	Special Purpose Vehicle
sq.km	Square Kilometre
SH	State Highway
SIPCOT	State Industries Promotion Corporation of Tamil Nadu Ltd
TN	Tamil Nadu
TIIC	Tamil Nadu Industrial Investment Corporation Ltd.
TIDCO	Tamil Nadu Industrial Development Corporation Ltd.
TANSIDCO	Tamil Nadu Small Industries Development Corporation Ltd
TP	Toll Plaza
UEPL	Ulundurpet Expressways Private Limited
US	United States of America
WPI	Wholesale Price Index
YOY	Year on Year

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1. INTRODUCTION

1.1 General

The project road Tindivanam-Ulundurpet is a section of the 472 km long old National highway 45 (NH-45) which is also known as the Great Southern Trunk Road (GST Road). GST road starts from Kathipara junction in Guindy area (Chennai City) and extends up to Theni (headquarters of Theni District). It is the primary corridor for traffic flow between Chennai (the state capital) and various other industrial towns and tourist places in the southern, eastern and western parts of Tamil Nadu. Major towns along NH-45 are Tambaram, Tindivanam, Villupuram, Perambalur, Tiruchirapalli, Dindigul and Theni. The alignment of NH-45 is depicted in **Figure 1-1**.

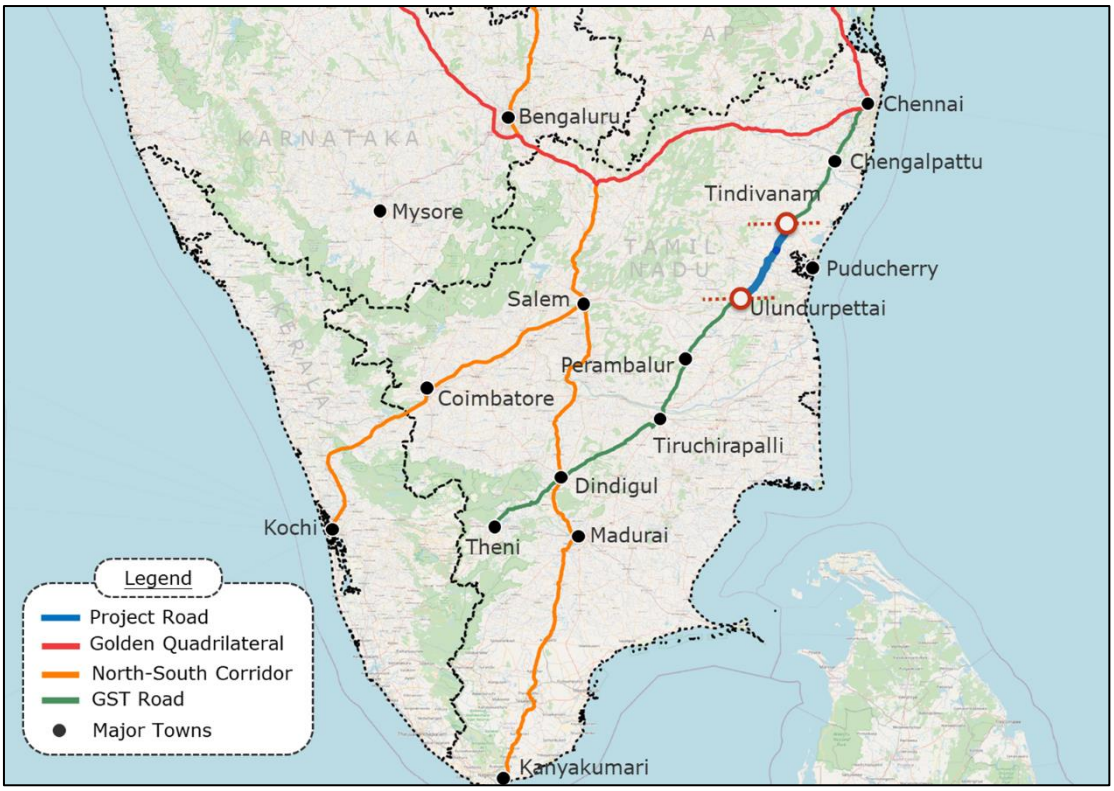


Figure 1-1: Alignment of National Highway No.45 (GST Road)

The project road section starts at Tindivanam (km 121.000) and ends at just north of Sengurichi (km 192.250). The tolling length of the project road is 72.90 km. The asset was awarded on BOT basis and is being run by the SPV – Ulundurpet Expressways Private Limited (UEPL) for a concession period of 20 years and tolling has been operational from July 2009.

M/s. Ramboll India Private Ltd has been engaged as Traffic Consultant to carry out a study for assessing the present traffic levels, travel pattern and revenue estimation duly considering the network characteristics, future economic perspective in the influence area of the project and the provisions in the Concession Agreement of the project for the balance concession period.

1.2 Objective and Scope of Work

The objective of the study is to analyse the existing tollable traffic, travel pattern and to estimate the future traffic and toll revenue for the project road.

The scope of services includes preparation of a due diligence report for the project road covering the following:

- 1 day OD Survey at each toll plaza
- Analysis of recent toll/traffic data up to February 2023 and its growth trends
- Estimation of the base AADT for FY23
- Analysis of OD data to cover:
  - Trip matrix and influence factors for different zones contributing traffic on the corridor
  - Identification of Project Influence Area from analysis of travel pattern - regional distribution of traffic
  - Commodity composition- Goods type distribution
  - Top OD pairs by vehicle types
- To study the impact of traffic diversion (from/to project road) in present condition and future improved scenario, a cost ratio-based diversion analysis using spreadsheet-based modelling out for potential OD pairs
- Identify factors which may have a positive and / or negative impact on the traffic - all major developments like industrial corridors, freight corridor, economic corridors, ports, Bharatmala, Sagarmala
- Upcoming developments and future development potential of the region would be assessed for the induced/newly generated traffic
- Traffic projections for the balance concession period in three scenarios – low, most likely and high
- Toll revenue estimates using WPI forecasts and tolling ticket segmentation
- Scenario analysis of toll revenue

1.3 Report Structure

The report is divided into four chapters, including this introduction chapter. Chapter 2 contains details pertaining to various traffic surveys conducted for data collection and its analysis to understand the base year traffic and travel characteristics in the Project Influence Area (PIA). Chapter 3 contains the details on the derivation of traffic growth rates used for traffic forecasting and presents traffic projections for the study period. Chapter 4 presents the details regarding tolling strategy, toll rates and the revenue projections for the duration of the concession.

2. TRAFFIC ANALYSIS

2.1 General

In order to understand the traffic characteristics, the travel pattern of vehicles plying on the project road were collected through primary surveys. This chapter presents the details of the project road characteristics, traffic surveys carried out, their analysis and the salient findings. The results of the analysis will be utilized in assessing the traffic growth and estimation of traffic and revenue forecast on the project road for the remaining concession period.

2.2 Project Road Characteristics

As mentioned earlier, the project road (PR) section of Tindivanam-Ulundurpet, is a part of old NH- 45 (GST Road) in the state of Tamil Nadu which starts at km 121.00 near Tindivanam and ends at km 192.25 near Sengurchi. The toll charges are being collected at the toll plaza located near Vikravandi town at km 149.2. The project road falls under the jurisdiction of Villupuram and Kallakurichi districts in the state of Tamil Nadu.

The schematic representation of project road alignment indicating the existing toll plaza, the surrounding road networks and the major town/villages are depicted in **Figure 2-1**.

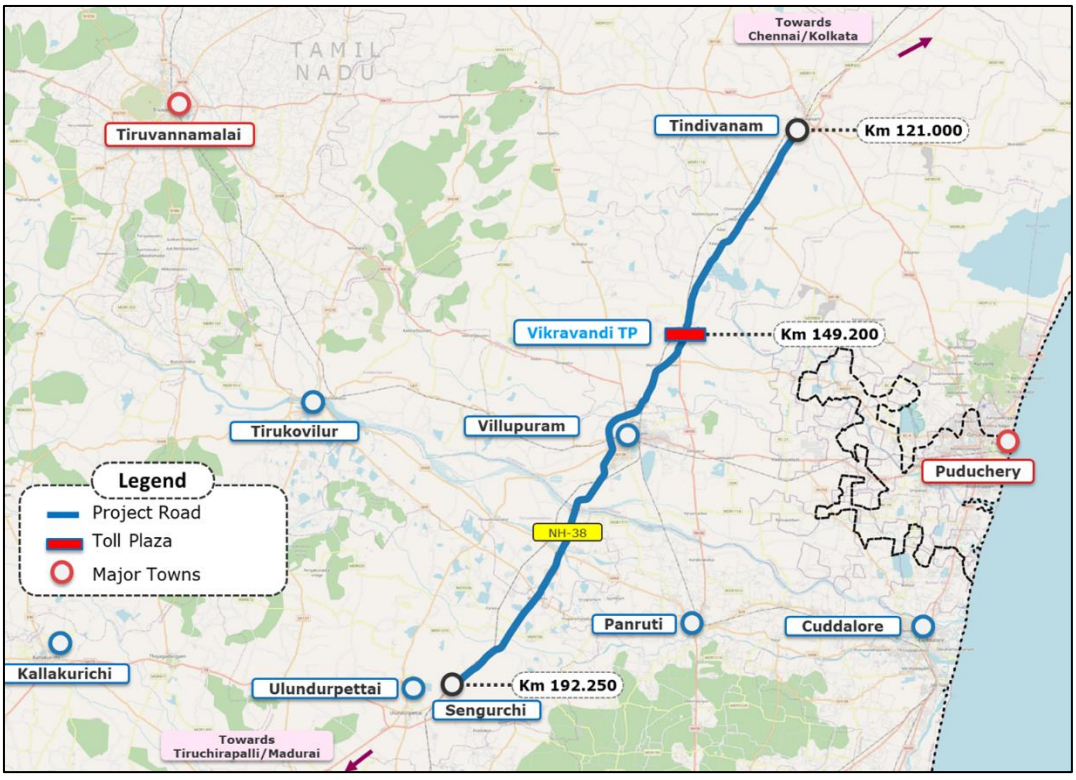


Figure 2-1 : Project Road Alignment and Surrounding Area

2.2.1 Network characteristics in the vicinity of the project road

The detail network assessment in the vicinity of the project section is presented in **Figure 2-2**.

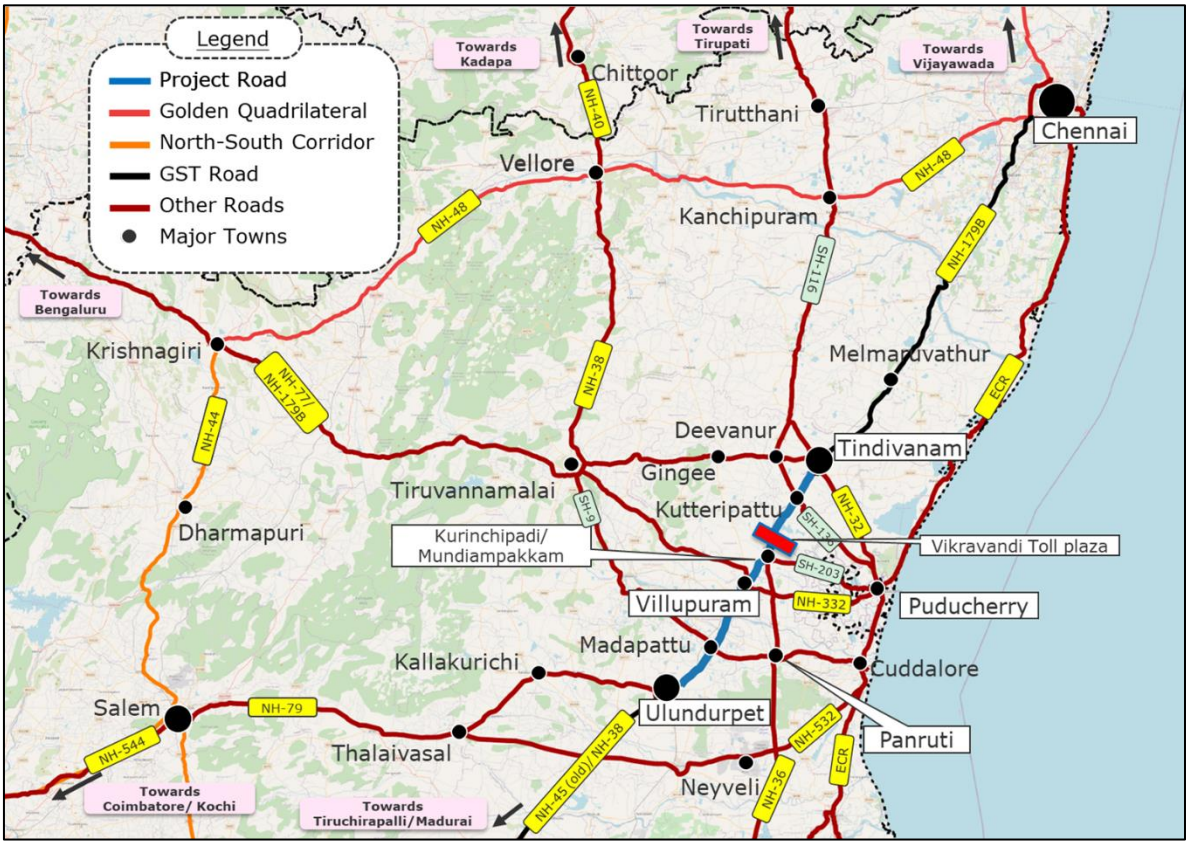


Figure 2-2: Network Characteristics in the Vicinity of the Project Road

The region is densely connected by various state and national highways, several of them criss-crossing or branching out from the project road. The project road is situated about 30 km away from Puducherry, one of the Union Territories of India which is well connected through several roads such as new NH-32 from Tindivanam, SH-136 from Kutteripattu, SH-203 from Mundiampakkam and new NH-332 from Villupuram. Along with these, new NH-38 connects the towns of Tiruvannamalai and Vellore to Villupuram, new NH-36 connecting Kumbakonam and Thanjavur from Kurinchipadi, SH-9 connecting Cuddalore from Madapattu via Panruti and several others.

The project road in wider context serves long-distance traffic generated from Chennai and surroundings and plying towards eastern/southern/western districts of Tamil Nadu such as Tiruchirapalli, Madurai, Salem, Coimbatore, etc. Apart from the long-distance traffic, it also caters to the local traffic movement between the towns of Tindivanam/ Melmaruvathur and Villupuram/ Panruti/ Kallakurichi.

2.2.2 Profile of Project Influence Area Districts - Villupuram (and Kallakurichi district)

Project road falls under the jurisdiction of Villupuram and Kallakurichi districts. Kallakurichi district was bifurcated from the Villupuram district in 2019 comprising of the talukas of Kallakurichi, Sankarapuram, Chinnasalem, Ulundurpet, Thirukovilur and Kalvarayanmalai. The towns of Villupuram and Kallakurichi are the respective headquarters of these two districts.

The erstwhile Villupuram district (including Kallakurichi) was one of the largest districts in Tamil Nadu. Villupuram town is located about 160 km from Chennai while Kallakurichi town is located about 80 km farther from Villupuram town. Gingee fort, which was built more than 500 years ago is located at Gingee town within Villupuram district.

The economy of these two districts is primarily agrarian in nature with about 3/4th of the population engaged in agriculture and allied activities for their livelihood. Paddy is the principal crop grown in the district which accounts for about 40 percent of the total cropped area. The two districts together contribute more than 10 percent of the state's food production every year.

Sugarcane is also grown in large areas as well and the region is known as the sugar bowl of Tamil Nadu. The sugar industry is the major industry in these two districts. Sugar mills such as Rajashree Sugars, CCSM Sugar Factory, EID Parry Sugar Mills and Madras Sugars Limited are located near to the project road corridor.

Silica sand, river sand, black granite, blue metal, and gravel are the mineral resources under production in the district. The state government has recently leased out river sand mining near Siruvanur village along the bank of river Then Pennai for a period of 2 years which is located in Villupuram district, south of toll plaza.

Along with these two districts, the traffic is also influenced by the nearby districts of Chennai, Ariyalur, Trichy, Madurai, Namakkal, Coimbatore, Thoothukudi, etc. Ariyalur district has reserves of limestone and hence lot of cement plants are operational in the district. Some of the biggest players such as Ramco Cements, UltraTech Cement, India Cements, Chettinad Cement, Dalmia Cement, etc. are located within Ariyalur distrct.

There are many other industries in the project influence area of the project road. Rice mills are present near Tindivanam and Vikravandi; industries such as Sun pharma, MRF Tyres, Marico Ltd, Whirlpool, etc. are present in and around Puducherry and Perambalur districts; Neyveli mines for fossil fuel mining and thermal power generation in Neyveli; Indian Oil storage in Asanur and industries in Trichy.

2.3 Traffic Surveys

In order to understand the characteristics of traffic using the project road, data on road network, traffic and travel pattern of vehicles plying on the project road were collected through primary traffic surveys. Origin-destination (OD) survey as roadside interview method for one day at toll plaza location was conducted on the project road. The schedule of the traffic survey is given in **Table 2-1**.

Location	Chainage	Duration	Date(s)
Origin and Destination Survey			
TP01 – Vikravandi TP	km 149.2	1 Day	3rd March 2023

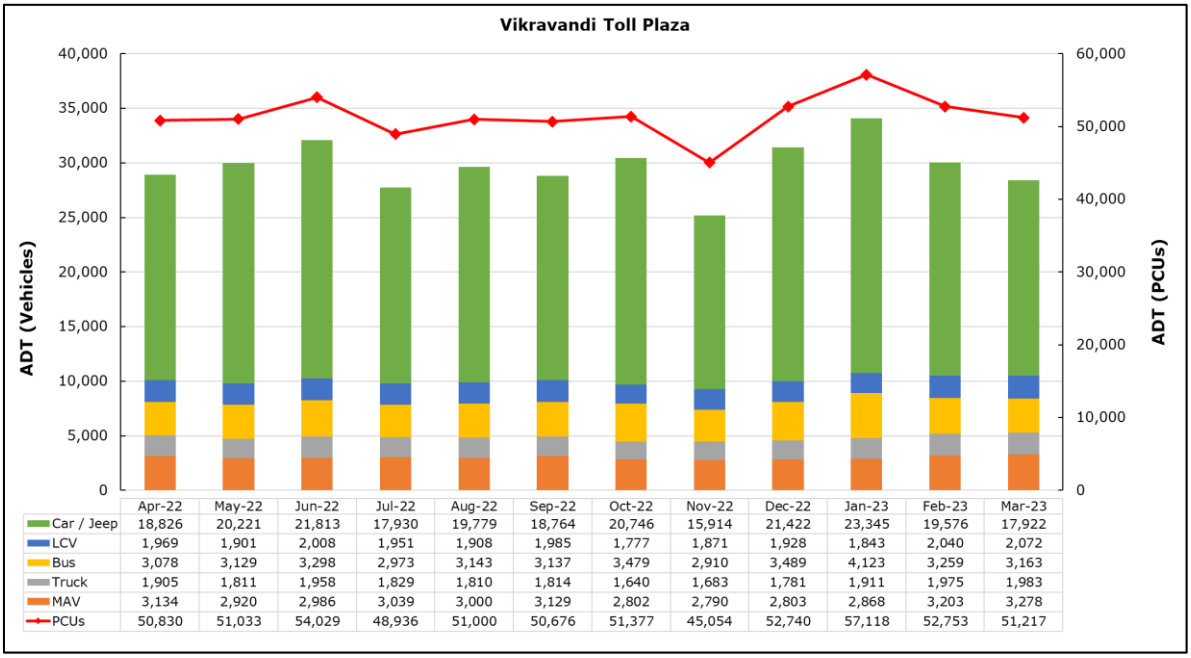
Table 2-1: Traffic Survey Location and Schedule

Trained enumerators were engaged for conducting the traffic survey under the supervision of experienced transport planners.

2.4 Traffic Characteristics – AADT FY23

The traffic data at the toll plaza location was provided by the client for the period from April 2010 (FY11) to March 2023 (FY23).

For FY23, 12 months data from April 2022 to March 2023 is available and is presented in **Figure 2-3**.



	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23
Car / Jeep	18,826	20,221	21,813	17,930	19,779	18,764	20,746	15,914	21,422	23,345	19,576	17,922
LCV	1,969	1,901	2,008	1,951	1,908	1,985	1,777	1,871	1,928	1,843	2,040	2,072
Bus	3,078	3,129	3,298	2,973	3,143	3,137	3,479	2,910	3,489	4,123	3,259	3,163
Truck	1,905	1,811	1,958	1,829	1,810	1,814	1,640	1,683	1,781	1,911	1,975	1,983
MAV	3,134	2,920	2,986	3,039	3,000	3,129	2,802	2,790	2,803	2,868	3,203	3,278
PCUs	50,830	51,033	54,029	48,936	51,000	50,676	51,377	45,054	52,740	57,118	52,753	51,217

Figure 2-3: MoM Traffic of FY23 on the Project Road

Traffic on this corridor is usually affected during monsoon and return monsoon period during July to September and November respectively.

For the estimation of base traffic for FY23, the 12-month average traffic of April 2022 to March 2023 has been considered as the AADT for FY23 which is presented in **Table 2-2**.

Description	Car	LCV	Bus	Truck	MAV	PCUs
AADT FY23	19,688	1,926	3,265	1,842	2,996	51,397

Table 2-2: AADT FY23 at Vikravandi TP Location as per Tolling Categories

2.5 Travel Characteristics

2.5.1 Survey Methodology

In order to understand the travel demand pattern in the region and tollable traffic streams, origin and destination (OD) surveys were carried out at the toll plaza location. The OD survey was carried out for 24 hours, by roadside interview method as described in IRC: 102-1988. Both passenger and commercial vehicles plying on the project road were stopped on a random sampling basis and interviewed.

The travel characteristics obtained by OD survey facilitate the identification of:

1. Local and through traffic on the project road.
2. Potential divertible traffic to/from project road to various alternative routes.

Trained enumerators under the supervision of transport planners collected the trip characteristics using survey forms designed for this purpose. The OD survey elicited characteristics like origin, destination, purpose of trip for passenger vehicles and commodity being transported for goods vehicles. The information pertaining to origin and destination of trips collected during roadside interviews was analysed to obtain the trip distribution based on a zoning system suitably designed for the present study.

2.5.2 Traffic Zoning System

To understand the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a detailed zoning system was developed giving due consideration to the following factors:

- The road network catering to the traffic on the project road and its generating points
- Important towns, villages, factories and industrial centres around the project road area
- Administrative boundaries of districts and states.
- Configuration of the project road in the regional road network with respect to other roads

Two major types of areas were identified for analysis purpose: -

Immediate Influence Area (IIA): It includes the cities/towns/villages and districts along the project road and adjacent to it, which generate/attract trips to the project road. In this study, it consists of districts of Villupuram, Kallakurichi, Kanchipuram, Chennai, Tiruvallur, Vellore, Tiruvannamalai and Cuddalore in the state of Tamil Nadu and also the Union Territory of Puducherry.

Broad Influence Area (BIA): It includes the remaining districts of Tamil Nadu and other neighbouring states such as Kerala, Andhra Pradesh, Telangana, Maharashtra, Karnataka and remaining states of India.

Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA. The zoning system adopted for data collection was based on 82 zones and is presented in **Appendix 2.1**.

2.5.3 Sample Size

The vehicles during the OD surveys were interviewed on a random sample basis. **Table 2-3** shows the AADT and the sample size (both in absolute numbers and in percentage terms) captured during the exercise.

Modes	Car/ Jeep	LCV	Bus	Truck	MAV
Samples	5,411	1,065	1,142	691	1,349
AADT FY23	19,688	1,926	3,265	1,842	2,996
Percentage (%)	27.5	55.3	35.0	37.5	45.0

Table 2-3: Sample Size Collected in OD Survey

Based on the sample size of different categories of vehicles interviewed during the OD survey, expansion factors were calculated based on AADT FY23. The OD matrices for all vehicle categories were generated and analysis was done in terms of regional distribution, travel pattern and commodity distribution.

2.5.4 Regional Distribution

Table 2-4 gives the distribution indicating the attraction and generation zones for the traffic on the project road.

Modes	Car/ Jeep	LCV	Bus	Truck	MAV
Tamil Nadu	95.9	96.0	97.7	94.3	85.2
Kerala	0.6	2.0	0.5	3.3	4.6
Andhra Pradesh	0.2	0.6	0.4	0.5	4.2
Puducherry	3.1	1.2	1.4	1.7	2.2
West Bengal	0.0	0.0	0.0	0.0	1.3
Telangana	0.0	0.1	0.0	0.1	0.3
Maharashtra	0.0	0.0	0.0	0.0	0.4
Karnataka	0.1	0.1	0.0	0.1	0.1
Rest of India	0.0	0.0	0.0	0.0	1.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 2-4: Regional Distribution of Tollable Traffic (in %) on Project Road

- The majority of the passenger/freight traffic on the project road at Vikravandi toll plaza location is only from the state of Tamil Nadu. About 96-98 percent of passenger traffic is generated from Tamil Nadu. In case of freight traffic, about 94-96 percent of LCVs and Trucks and about 85 percent of MAVs are generated from Tamil Nadu. Puducherry contributes about 1-3 percent across all the modes.
- Chennai being the state capital and a large metropolis, contributes to majority of the traffic (about 34-38 percent of all modes) from the north side of the project road within Tamil Nadu. The districts of Villupuram, Tiruchirapalli, Madurai, Salem, Coimbatore, etc. are the major contributors to traffic from the south side of project road within Tamil Nadu.
- Kerala contributes about 3-5 percent in Trucks and MAVs while Andhra Pradesh contributes about 4 percent in MAVs. Within Kerala, major traffic generators are Kochi, Kozhikode and Calicut and the vehicles mostly carry fish (live and dry), petroleum products, auto parts, parcels, etc., while within Andhra Pradesh, major traffic generators are Vijayawada, Vishakhapatnam, Nellore, Ongole, etc and the vehicles mostly carry rice, steel, cement, etc.

The mode wise top 20 OD pairs are given in **Appendix 2.2**.

2.5.5 Travel Pattern

In order to assess the travel pattern of vehicles, the important streams of traffic plying on the project road are estimated. The list of the popular movements found at the toll plaza location is presented in **Table 2-5**.

S.No.	Traffic Stream	Car/ Jeep	LCV	Bus	Truck	MAV
1	Tindivanam & Surroundings - Villupuram/ Cuddalore & Surroundings	13.0%	11.6%	11.4%	18.2%	6.7%
2	Tindivanam & Surroundings - Madurai/ Trichy & Surroundings	2.2%	1.1%	0.9%	1.4%	0.8%
3	Tindivanam & Surroundings - Tuticorin & Surroundings	0.2%	0.2%	0.1%	0.2%	0.2%
4	Tindivanam & Surroundings - Salem/ Coimbatore & Surroundings	1.5%	1.3%	0.5%	1.1%	1.0%
5	Tindivanam & Surroundings - Kerala	0.1%	0.3%	0.0%	0.8%	0.6%
6	Chennai/Kanchipuram/Vellore - Villupuram/ Cuddalore & Surroundings	34.9%	28.9%	35.9%	23.1%	16.9%
7	Chennai/Kanchipuram/Vellore - Madurai/ Trichy & Surroundings	24.5%	23.1%	27.9%	21.2%	26.4%
8	Chennai/Kanchipuram/Vellore - Tuticorin & Surroundings	3.5%	5.0%	4.7%	4.3%	6.2%
9	Chennai/Kanchipuram/Vellore - Salem/ Coimbatore & Surroundings	18.5%	23.4%	16.8%	22.6%	19.6%
10	Chennai/Kanchipuram/Vellore - Kerala	1.2%	3.7%	1.0%	5.9%	5.6%
11	Beyond Chennai to Villupuram/Madurai & Beyond	0.4%	1.0%	0.5%	1.1%	10.2%
12	Beyond Chennai to Salem/Coimbatore & Beyond	0.1%	0.5%	0.3%	0.0%	5.7%
Total		**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 2-5: Traffic Streams on Project Road

Passenger Traffic

- In case of passenger traffic, about 35-36 percent of cars as well as buses ply between Chennai/ Kanchipuram/ Vellore and Villupuram/ Cuddalore & surroundings (stream 6) while about 24-28 percent of cars and buses ply between Chennai/ Kanchipuram/ Vellore and Madurai/ Trichy & surroundings (stream 7).
- About 11-13 percent of cars and buses ply between Tindivanam & surroundings and Villupuram/ Cuddalore & surroundings which are short distance movements (stream 1).

- About 73 percent of all car trips are work & business trips while another 12 percent of the trips are social trips. Majority of the work & business trips are destined towards Chennai.

Freight Traffic

- In case of Freight Traffic, long distance traffic between Chennai/ Kanchipuram/ Vellore to other parts of Tamil Nadu predominates.
- Traffic between Chennai/ Kanchipuram/ Vellore and Villupuram/ Cuddalore & surroundings account for about 23-29 percent of LCVs and Trucks and about 17 percent of MAVs (stream 6). Sand is one of the commodities which is being transported from Villupuram district to Chennai and surrounding areas.
- Traffic between Chennai/ Kanchipuram/ Vellore and Madurai/ Trichy & surroundings account for about 21-26 percent of all freight traffic (stream 7). Major commodities being transported include cement, parcel, miscellaneous items, etc.
- Traffic between Chennai/ Kanchipuram/ Vellore and Salem/ Coimbatore & surroundings account for about 20-23 percent of all freight traffic (stream 9). Major commodities being transported include parcel, miscellaneous items, auto parts, eggs, etc.

2.5.6 Commodity Distribution

Analysis was also carried out to understand the different commercial vehicles being used to transport different commodities. The commodity distribution for project corridor is presented in **Figure 2-4**.

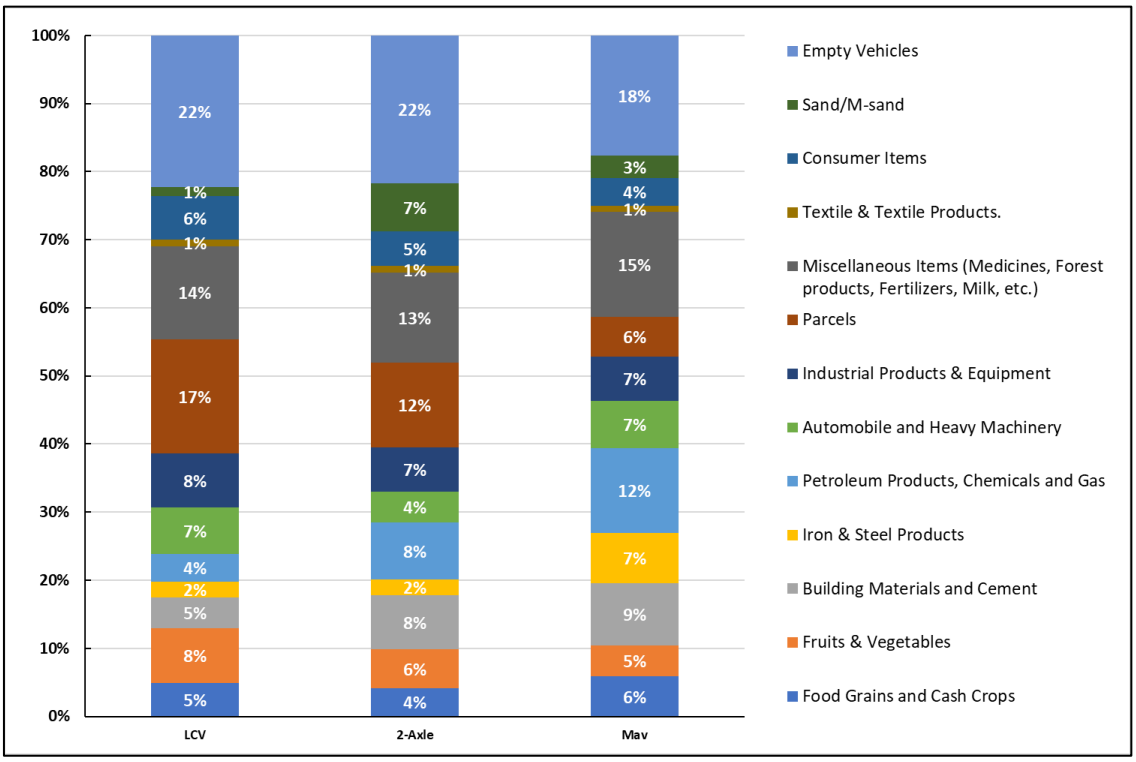


Figure 2-4: Commodity-wise Distribution of Different Freight Traffic Modes across the Toll plaza

- Commodities such as fruits and vegetables, building materials and cement, iron and steel products, petroleum products, industrial products & equipments, parcels, miscellaneous items and sand were found in high shares crossing the toll plaza.
- Fruits and vegetables account for about 5-6 percent in Trucks and MAVs and about 8 percent in LCVs which are generally used to transport fruits and vegetables such as watermelon, jackfruit, etc., to local markets and mandis.
- About 8 percent of Trucks and about 12 percent of MAVs carry petroleum products, chemical and gas. These trucks were mostly generated from around the port towns of Chennai, Thoothukudi, Kochi, IOCL plant at Asanur, etc.
- About 4-7 percent of all modes carry automobile, spare parts and heavy machineries such as harvestors, etc. Chennai, with its large automobile hub manufactures a lot of automobiles, parts, spares, etc. which are transported to different areas of Tamil Nadu. Also, automobile parts, tyres, etc., are also transported from Salem, Madurai, Tiruchirapalli, Coimbatore, etc. areas to factories in Chennai.
- Consumer items account for about 4-6 percent across all the modes. These include household and FMCG products such as biscuits, salt, sugar, chips, eggs, etc. Salt is produced around the salt pans of Thoothukudi and are transported to Chennai and other areas. It is to be noted that Namakkal is known as the Egg-capital of India and several vehicles were found to carry eggs in both direction to/from Namakkal, Salem, etc.
- Miscellaneous items account for about 12-20 percent across different modes. These include medicines, fertilizers, milk, paints, alcohol, etc. Trucks carrying milk was observed across both directions in varying shares.

Table 2-6 presents the commodity-wise share of the total commercial traffic across both the directions on the project road at Vikravandi toll plaza.

Tindivanam – Ulundurpet (North – South)			Direction	Ulundurpet – Tindivanam (South – North)		
LCV	Truck	MAV	Commodity Type	LCV	Truck	MAV
5.7	4.7	7.7	Food Grains & Cash Crops	4.1	3.8	3.9
9.1	6.0	6.1	Fruits & Vegetables	7.1	5.4	3.0
4.7	9.7	7.7	Building Materials & Cement	4.4	6.4	10.5
2.6	3.1	11.1	Iron & Steel Products	2.1	1.6	3.6
5.7	8.5	12.4	Petroleum Products, Chemicals & Gas	2.5	8.3	12.5
6.8	6.3	5.8	Automobile & Heavy Machinery	6.9	2.9	8.0
7.3	6.0	8.9	Industrial Products & Equipments	8.5	7.0	4.1
12.8	12.6	3.1	Parcels	20.2	12.3	8.6
14.6	15.7	18.4	Miscellaneous Items (Medicines, Forest products, Fertilizers, Milk, etc.)	12.9	11.0	12.3
0.3	1.6	0.9	Textile & Textile Products	1.6	0.5	0.9
6.5	4.4	3.5	Consumer Items	6.2	5.6	4.7

Tindivanam – Ulundurpet (North – South)			Direction	Ulundurpet – Tindivanam (South – North)		
LCV	Truck	MAV	Commodity Type	LCV	Truck	MAV
2.3	2.2	1.0	Sand/M-sand	0.5	11.3	5.7
21.4	19.2	13.2	Empty Vehicles	23.0	23.9	22.3
100.0	**100.0**	**100.0**	**Total**	**100.0**	**100.0**	**100.0**

Table 2-6: Commodity Distribution of Tollable Traffic (%)

- Considering the directional flow of different commodities across the toll plaza, some commodities have higher share in a particular direction.
- Building materials and cement have slightly skewed commodity flow with building materials such as gravel, stone chips, tar, etc., moving primarily from Tindivanam to Ulundurpet direction while cement primarily moves in the other direction. These building materials which are being used in various road construction projects along different districts on the southern side of the project road are generated from areas around Tindivanam, Kanchipuram, etc and are carried in Trucks and MAVs (primarily 3 Axle). Cement is primarily being carried in MAVs which are generated from the cement factories in Ariyalur district.
- Industrial products have slightly higher share in Tindivanam to Ulundurpet direction since high number of industrial areas are located in and around Chennai which supply different manufactured items to the other districts in Tamil Nadu.
- Sand, which is generated from the banks of Then Pennai river on the south of the toll plaza is being supplied to Chennai, Kanchipuram and surrounding areas. About 11 percent of Trucks and 6 percent of MAVs (majority of MAVs appear to be 3Axle as per visual observation) in the direction of Ulundurpet to Tindivanam carry sand.

3. TRAFFIC GROWTH RATE AND PROJECTIONS

3.1 General

As the project road has been executed on a BOT basis with a concession period of 20 years, an estimation of the traffic using the tolled highway and its future growth are important elements to assess the project's economics as these are generally the main/sole source of revenue for the project. This chapter details various aspects of the current traffic of the project road and its growth potential.

3.2 Project Road Traffic

The traffic that is likely to use the project road is estimated on the basis of the traffic and travel characteristics. The traffic on the project road would normally consist of the following components:

- Normal Traffic
- Diverted Traffic
- Induced/Developmental Traffic

3.2.1 Normal Traffic

Normal traffic is the traffic, which is already plying on the project road in FY23 and presented in Table 2.1.

3.2.2 Diverted Traffic

Diverted traffic is generally dictated by the presence of an alternative route at a lower generalised cost, which is in-turn defined by the road configuration and its condition, the type of vehicle and its operating costs, the average riding speed, the route distance and any tolling that may apply on a specific route.

In case of the project road, the proposed Chennai – Salem Expressway is an alternate route to the project road for the traffic plying between Chennai & surroundings and Salem & beyond. The expressway will have 6-lane configuration and will be about 274 km in length. The expressway will be developed as a greenfield alignment starting at Tambaram and passing through the districts of Kanchipuram, Tiruvannamalai, Krishnagiri and Dharmapuri and finally ending at Salem. The alignment of the proposed expressway and existing routes are presented in **Figure 3-1**.

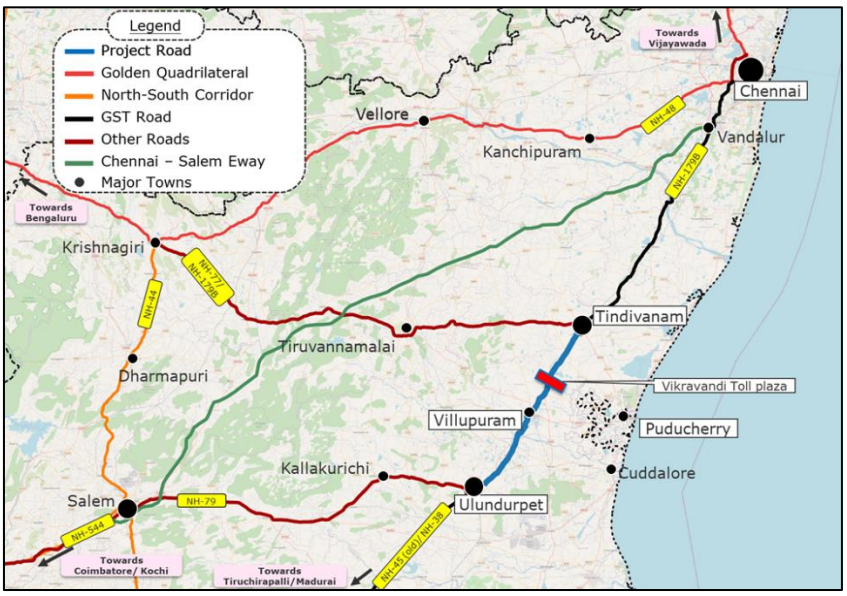


Figure 3-1: Alignment of Chennai - Salem Expressway and Project Road

The existing route via the project road is about 340 km long and takes about 6 hours to reach Salem from Chennai. The proposed expressway will reduce the distance by about 70 km and expected to reduce the travel time by about 2.5 hours. Therefore, the expressway is likely to benefit road users in terms of travel time and cost savings.

The Chennai – Salem expressway was initially planned to be completed by December 2025. DPR has been prepared and land acquisition notifications were issued earlier. However, as per information available in public domain, the expressway's proposals have received stiff opposition from the farmers and social activists as the greenfield alignment will pass through reserve forests and ghat sections and will require agricultural lands from farmers. As per news reports, detailed social and environmental impact assessment study will be carried out before progressing with other aspects of the project. Due to the stiff opposition and slow progress of work, the expressway's completion timeline is likely to get delayed further by a few years and is not likely to adversely impact the project road traffic during the balance period of concession which will end in FY27.

3.2.3 Induced/ Development Traffic

Developmental /new generated traffic is the one which would be generated, over and above normal growth, because of lowering of transport costs or new developments in the immediate influence area of the project road. In case of the project road, no new major development is known to be developed in the vicinity which could impact the project road traffic.

Bharatmala Pariyojana is the second largest highways construction project in the country since NHDP, under which almost 50,000 km or highway roads were targeted across the country. It will look to improve connectivity particularly on economic corridors, border areas and far-flung areas with an aim of quicker movement of cargo and boosting exports.

It will connect 550 district headquarters to minimum 4-lane highway by raising the number of corridors to 50 (from current 6) and move 80 percent freight traffic (currently 40 percent) to national highways by connecting 24 logistics parks and 7 north east multimodal waterway ports.

The Phase-I includes economic corridors of around 9,000 km; inter-corridor and feeder routes of around 6,000 km; 5,000 km roads under the National Corridors Efficiency Program, border and international connectivity roads of around 2,000 km; coastal and port connectivity roads of around 2,000 km; expressways of around 800 km and 10,000 km of NHDP roads. The total length in phase 1 comes to around 34,800 km.

East Coast Economic Corridor (ECEC)

As per Bharatmala Pariyojana, the East Coast Economic Corridor (ECEC) is India's first coastal economic corridor covering 2,500 km of India's coastline, to be developed with the help of the Asian Development Bank (ADB). ECEC will be implemented in three phases.

- Phase-1 includes Vizag-Chennai Industrial Corridor, which covers Andhra Pradesh
- Phase II covers Chennai-Kanyakumari Industrial Corridor (CKIC) and
- Phase III covers Odisha and West Bengal.

Chennai – Madurai/Kanyakumari section is identified as one of the economic corridors and the project road is a part of this section which is depicted in **Figure 3-2**.

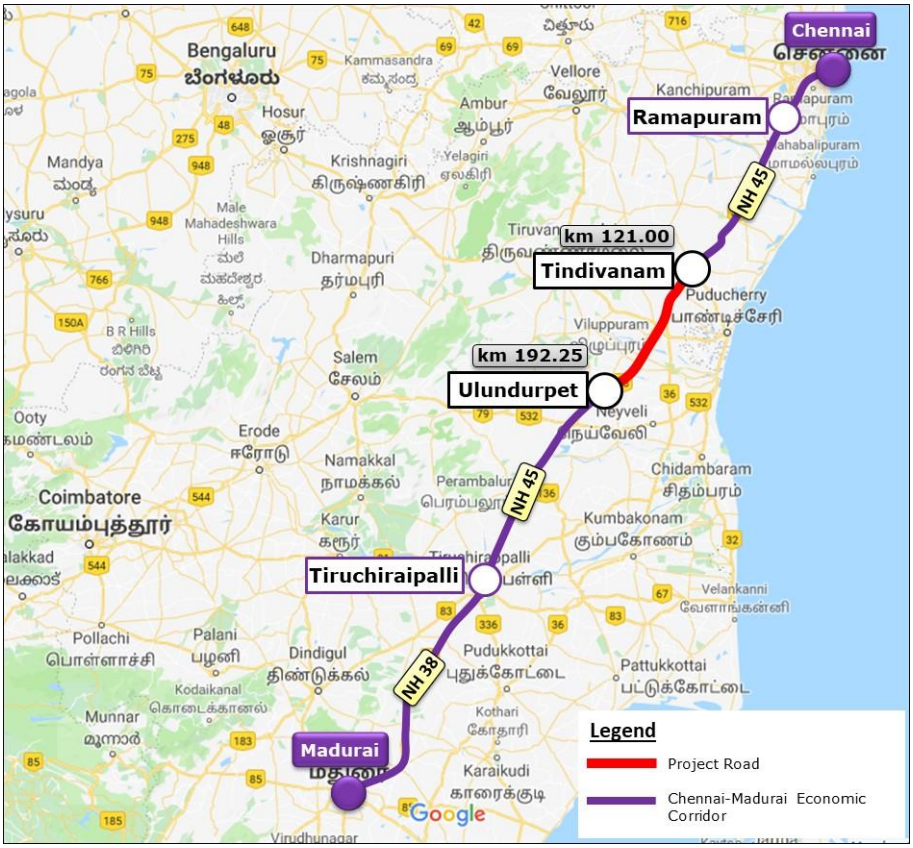


Figure 3-2: Alignment of the Economic Corridor Along With PR

As part of CKIC development, 6 industrial nodes have been identified. Of these, master plans have been prepared for two industrial nodes of Madurai – Dindigul – Virudhunagar – Theni (8,232 acres) and Thoothukudi – Tirunelveli corridor (11,248 acres) under phase 1 of CKIC. Initial road and power infrastructure development process in ongoing through ADB funding. The Tamil Nadu Industrial Development Corporation (TIDCO) has established a large-scale furniture manufacturing park on 1,152 acres of land in Thoothukudi industrial park. Further, ADB has signed agreement with GoI to facilitate $484 million loan to improve transport connectivity and facilitate industrial development in the CKIC in Tamil Nadu.

The complete development of East Coast corridor is to take 10-15 years which is beyond the end of the concession period of the project road. As the project road is a connecting link in this economic corridor, it is likely to remain an important national highway for the Chennai-Madurai movement.

Ennore – Thiruvallur – Bengaluru – Puducherry – Nagapattinam – Madurai – Tuticorin Pipeline (ETBPNMTPL) Project

IOCL is implementing the ETBPNMTPL natural gas pipeline project having capacity of pipeline of 84.67 MMSCMD and with a length of approximately 1,400 km. The pipeline runs from Ennore to Madurai and Tuticorin via Nagapattinam and Puducherry and also branches out to Bengaluru in Karnataka via Thiruvallur. The pipeline will source gas from 5 mtpa LNG terminal at Ennore as well as ONGC gas fields at Ramanathapuram. The pipeline will supply of natural gas to industries as well as to consumers of various cities.

Even though the Ennore – Thiruvallur – Bangalore pipeline section has been commissioned, the construction of Ennore – Puducherry – Nagapattinam – Madurai – Tuticorin section has been slow due to issues with land acquisition. The project is anticipated for commissioning at the end of FY24/beginning of FY25.

In view of the delay in commissioning of the pipeline project and the further time required for the development of city gas distribution networks, the pipeline project is not envisaged to adversely affect traffic on the project road for which the concession will end in FY27.

3.3 Methodology for Traffic Growth Rate Estimation

3.3.1 Methodology

Traffic growth for both passenger and freight vehicles has been estimated using the econometric approach as described in IRC-108, 2015. For freight traffic, due consideration has been given to the total tonnage transported and the shift in types of vehicles used for moving goods.

The econometric model applied, relates traffic growth to changes in state (or district) domestic product via an elasticity factor. According to IRC guidelines, elasticity based econometric model for highway projects should be derived in the following form:

Log e (P) = A0 + A1 Log e (EI)

Where:

P = Traffic Volume

EI = Economic Indicator

A0 = Regression constant

A1 = Regression co-efficient (Elasticity Index).

In order to estimate traffic on the project road the methodology described below has been followed:

- Identify the influence area - From the analysis of travel patterns observed during the OD surveys, the influencing states and districts, which are likely to impact the traffic growth on the project road, were identified.
- Review Past traffic Data – Based on data points available for the project corridor from different sources a review of past traffic and tonnage growth is carried out.
- Analysis of economic growth of the Project Influencing Area (PIA) - For each PIA state an economic profile describing past performance and future outlook was prepared. This also considers India's past economic performance and its future outlook.
- Estimation of traffic elasticity to income – in order to translate economic growth into traffic growth, an elasticity factor was estimated.
- Derivation of traffic growth rates – On the basis of the traffic weighted PIA outlook and related traffic elasticity, traffic growth rates were estimated.

The methodology thus adopted incorporates, as basic data inputs, the perspective growth envisaged in the influence area and the changes in transport demand elasticities over a period of time. The traffic growth rates by vehicle type for the project road have been determined till FY27 in line with the maximum possible extension of the concession period.

3.4 Identification of PIA States

The travel pattern observed on the project road reveals that total passenger and freight traffic is contributed entirely by Tamil Nadu with a share of 100 percent each.

With the passenger and freight traffic being majorly from Tamil Nadu, it has been considered as the PIA state.

3.5 Past Economic Growth of PIA

Growth of traffic on the project road depends on existing developments and future growth prospects of the connecting regions. A number of economic indicators for the PIA state,

as published by Central Statistical Organisation (2011/12 prices), have been studied to assess its past performance.

Primary PIA State – Tamil Nadu

- Tamil Nadu's Gross State Domestic Product (GSDP) stood at Rs 12,438.3 billion in 2019-20 and has been growing at a compounded annual growth rate of 6.9 percent since 2011-12.
- The GSDP for the year 2021-22 is Rs 13,451.1 billion and shows a growth of 8 percent due to low base of FY21.
- The service sector is the largest contributor to GSDP (51.1 percent), secondary sector at 36.8 percent and agriculture allied activities at 12 percent of the GSDP in 2021-22.

The change of sectoral composition of GSDP over the years is presented in **Figure 3-3**.

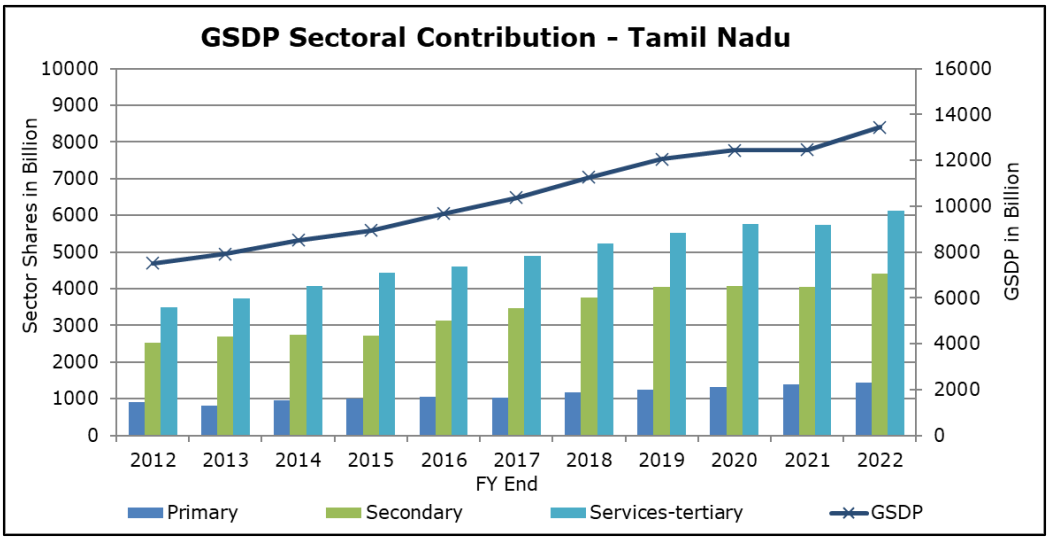


Figure 3-3: GSDP (in Rs billion) and its Sectoral Composition for Tamil Nadu

The performance of the state economy and its different sectors has been studied using time trend analysis. The average annual growth rates as obtained using regression analysis are presented in **Table 3-1**.

Particulars	2011-12 to 2019-20	2014-15 to 2019-20
GSDP	6.9	7.1
Agriculture and Allied	5.5	5.8
Industry	6.9	8.6
Services	6.5	5.6
Construction	4.5	5.0
Per Capita Income	6.2	6.5

Table 3-1 : Average Annual Growth Rates (%) of State Income for Tamil Nadu

Tamil Nadu is a predominant exporter of motor vehicles, readymade garments, auto components, etc. Currently, the state has 49 operational exporting Special Economic Zones (SEZs). Also, 57 more have been formally approved, 54 have been notified and 5 within-principle approvals. These SEZs are dispersed over a manifold range of sectors including textiles, footwear, multi-product, pharma, IT SEZs, etc.

Tamil Nadu Industrial Development Corporation Ltd. (TIDCO), State Industries Promotion Corporation of Tamil Nadu (SIPCOT), Tamil Nadu Industrial Investment Corporation Ltd. (TIIC) & Tamil Nadu Small Industries Development Corporation Ltd (TANSIDCO) are the bodies working together to develop and foster industrial infrastructure in the state. Some of the major hubs in the state are Tiruvallur, Kanchipuram, Tirunelveli, Bargur, Tiruvannamalai, Ramanathapuram Chennai and Coimbatore.

In September 2021, Ministry for Rural Industries announced that four industrial estates will be established across Tamil Nadu to ensure balanced growth across the state. The industrial estates will be developed by the Tamil Nadu Small Industries Development Corporation (Tansidco) at Manapparai in Tiruchirappalli district, Kaverirajapuram in Thiruvallur district, Kodur in Chengalpattu district, and Sakkimangalam in Madurai district, across a total of 394 acres at a project cost of Rs. 218.22 crore (US$ 38.20 million) and is expected to generate 7,000 jobs.

According to by Department for Promotion of Industry and Internal Trade (DPIIT), the state has enticed the Foreign Direct Investment (FDI) equity inflows worth US$ 34.58 billion during the period April 2000 to March 2021.

In order to attract high investments and catalyze growth, the state is highlighting the need to facilitate port logistics and road infrastructure development. The state has anticipated to develop two industrial corridors, namely, Chennai-Bengaluru & Madurai-Tuticorin. The state has also planned to develop three greenfield and five minor ports with an estimated cumulative capacity of 150 million tonnes.

The state houses 18 IT related SEZs and has emerged as an IT hub and houses key IT players like Tech Mahindra, TCS, Infosys, HCL, etc.

The per capita income of Tamil Nadu is Rs 1,75,748 in the year 2021-22. During FY11 to FY22, a growth of about 5.6 percent is seen in the state Tamil Nadu. The growth in per capita income of Tamil Nadu since 2011-12 is presented in **Figure 3-4**.

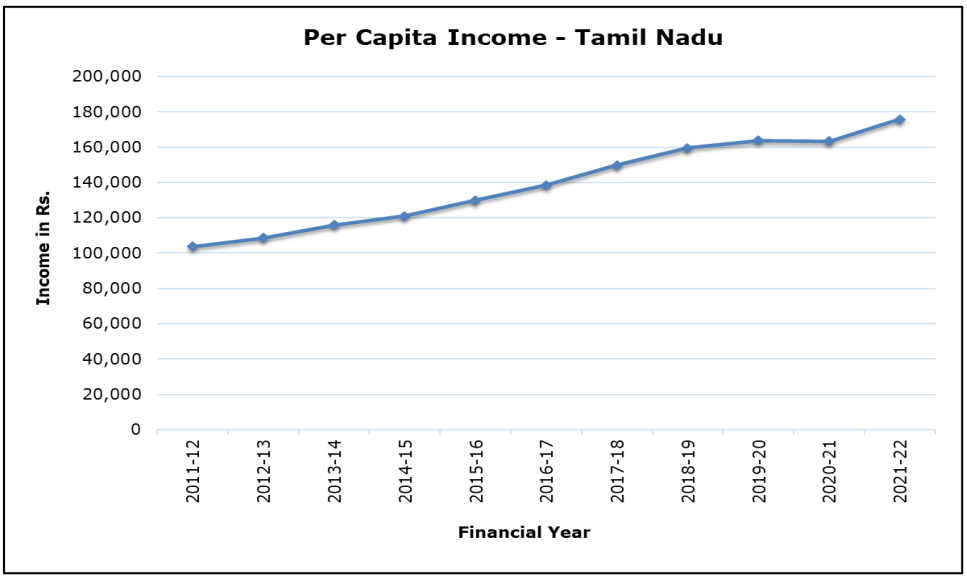


Figure 3-4: Per Capita Income of Tamil Nadu 2011-12 to 2021-22

3.6 India and PIA Outlook

3.6.1 India's past performance and outlook for future

India's growth trend during the recent years has been presented in **Figure 3-5**.

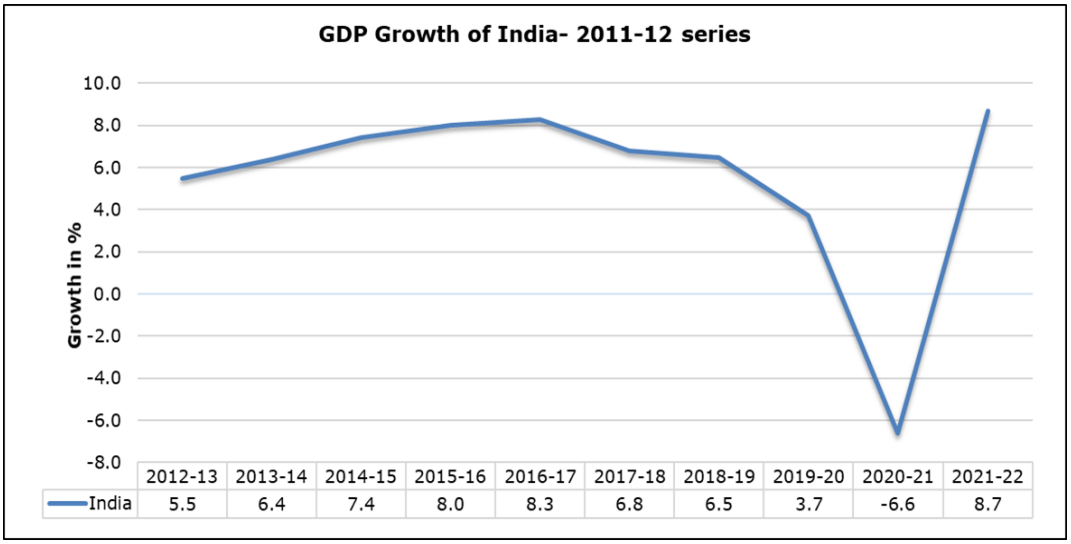


Figure 3-5: GDP Growth in India

Economic growth in India has been broadly on an accelerating path till FY18. It is likely to be the fastest growing major economy in the world in the medium-term. The growth in real GDP was 8.3 percent for FY17 and 6.8 percent in FY18, while the growth in FY19 was slightly lower at 6.5 percent. The long-term trend line growth of 7.2 percent has been achieved between FY12 to FY19. During FY20, growth has slowed down due to some structural issues and global headwinds resulting in an average GDP growth rate of 3.7 percent.

With the outbreak of COVID-19, global recession was witnessed across all the economies. The lockdown period announced by Indian government had an adverse impact on the economy. The first quarter estimated for FY21 has indicated a contraction of 23.9 percent, second quarter showed a rebound in growth by contracting 7.5 percent and third & fourth quarter grew by 0.5 percent and 1.6 percent respectively. The resultant contraction for FY21 has been 6.6 percent.

The Indian economy is likely to see the impact of global slowdown due to COVID-19 and hence, the GDP forecast for India by various international agencies has been revised for the next two years. As per the latest update by Central Statistical Organisation (CSO), GDP in FY22 has grown by 8.7 percent. As per Economic Survey of India for FY23, the economy is predicted to have a growth rate of 7.0 percent in FY23 and 6.0-6.8 percent in FY24. As per the latest forecast of RBI, the economy is likely to grow at 6.4 percent in FY24.

In light of the outlook being predicted by various agencies for the current years and likely revival thereafter spread over a couple of years, the year-on-year growth for Indian

economy based and PIA state as provided by the client from FY24 and beyond is presented in **Figure 3-6**.

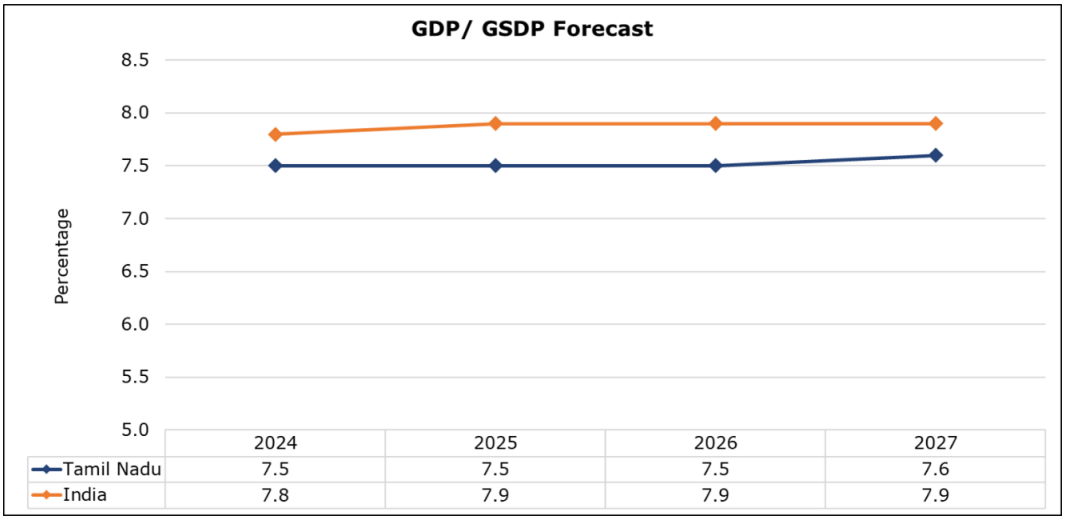


Figure 3-6: GDP Forecast

3.6.2 PIA States Outlook

A snapshot of the main economic indicators in the past for the PIA states is presented in **Table 3-2**.

Indicators	Tamil Nadu
GSDP in Rs Billion in FY20	12,438.4
GSDP growth (FY12 to FY20)	6.9%
Per capita Income in Rs (FY20)	163,874
Sector Share (%) in FY20	
Agriculture and allied	11.8
Industry	36.5
Services	51.6

Table 3-2: Main Economic Indicators of Tamil Nadu

3.7 Past Traffic Data on Project Road

The toll traffic data for the project road from April 2010 till March 2023 was provided by the client. The past traffic data along with the FY23 AADT is presented in **Figure 3-7**.

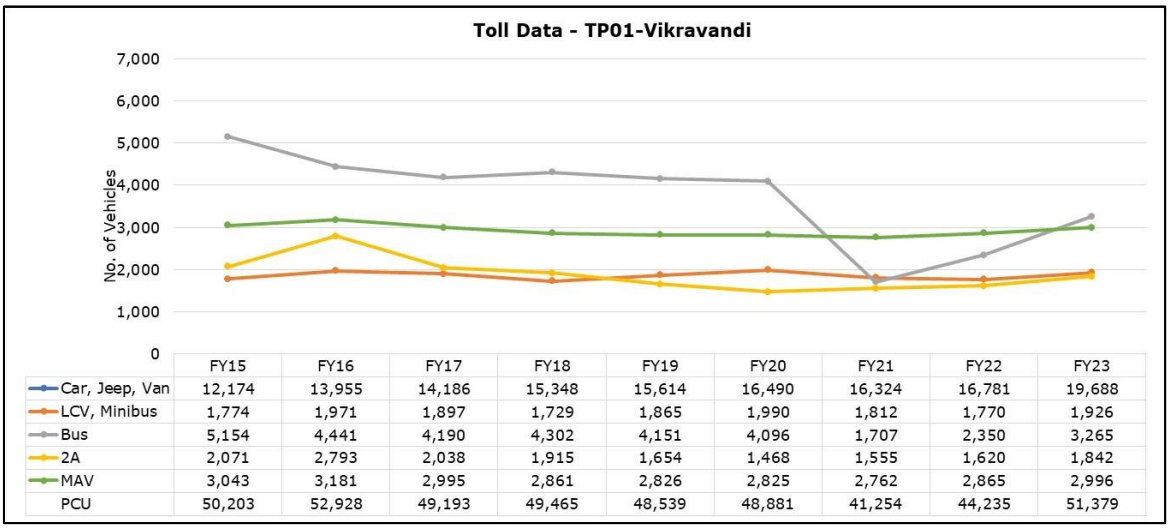


Figure 3-7: Past Traffic Data at the Project Road

A time series analysis of the traffic data and comparison of the yearly averages with the FY23 total traffic including exemptions and violations is presented in **Table 3-3**.

FY/Mode	Cars	LCV/MBus	Bus	2A	MAV	PCU
TP01-Vikravandi						
Trendline Growth in %						
FY11 vs FY23	7.2	2.0	-4.3	2.2	0.9	1.3
FY15 vs FY23	4.8	0.1	-8.9	-4.7	-0.9	-1.3
FY19 vs FY23	4.9	-0.5	-9.8	3.2	1.3	0.1
FY20 vs FY23	5.8	-1.2	-3.5	7.5	2.2	2.2

Table 3-3: Past Growth and Trend Analysis

The comparison of past toll data from the toll plaza shows a fluctuating growth across all modes. In car/jeep traffic, growth was positive across all years except the covid impact seen in FY21. The trend line growth for the period FY11 to FY23 has been 7.2 percent, however, the recent years of FY19 and FY23 show a growth of 4.9 percent.

LCV/Minibus category has shown YOY variations and in the comparison between FY11 and FY23 around 2 percent growth was observed.

Bus have shown a negative trend in the past, there seems to be a cross classification issue between Bus and Truck category in FY14 which has led to unusual growth. Bus number has shown a pickup in FY22 and FY23 as covid norms are relaxed and most of the population is vaccinated now.

In 2A truck category, a decline was observed in the traffic in most of the years. The comparison between FY11 and FY23 has shown a growth of 2.2 percent. The recent years have shown a growth varying between 4.0 and 13 percent. The combined category of Bus and truck also shows a high growth between FY21 and FY23. This is primarily due to the high growth seen in buses in FY22 and FY23.

In the previous years, between FY15/FY17 to FY23 the growth of MAV trucks (3A/MAV) has been negative. This corridor has been impacted intermittently by the ban on sand mining since FY17. This is one of the reasons for stagnant growth in trucks since FY18 to FY20. The MAVs has shown a growth of 2.2 percent during FY20 to FY23. In the year-on-year comparison of FY21 vs FY22 and FY22 vs FY23, MAVs have shown a growth of 3.7 percent and 4.6 percent respectively. This could partly be the result of the legalised sand mining regulations imposed by the Tamil Nadu Government.

All the political parties in Tamil Nadu did an agitation in the month of April-2018 due to Cauvery water issue leading to a tensed situation in TN and Karnataka border due to which the commercial traffic was reduced. The other main factors that might have impacted the traffic in the past include the impact of demonetisation in November 2016, GST in July 2017, all India truckers' strike in July 2018, revision of permissible Gross Vehicle Weights (GVW) for freight vehicle as per the new notification released by

NHAI on 18th July,2018 and the impact of country wide/ state lockdowns starting from March 2020 and continuing in few months of FY21.

3.8 Present and Future Transport Demand Elasticity

The econometric model applied for the project, relates traffic growth to changes in state domestic product via an elasticity factor according to IRC guidelines. The elasticity by vehicle types have been estimated based on the regression analysis of weighted income of PIA states with the actual traffic data.

A regression between GSDP (as independent variable) and registered vehicles (as dependant variable) of Tamil Nadu during FY12 to FY19 was carried out. The results have shown a positive relationship having elasticities values of 1.1 and 0.5 in cars and trucks respectively.

The best measure of deriving traffic elasticity to income is time series data of traffic on the road. In case of the project road, past traffic data is available since the year of operation of the toll plaza. The YOY mode wise traffic elasticity has been derived using rate of growth in the traffic vis a vis the rate of growth in income (weighted income derived from weighted OD shares). The elasticity estimates for different time periods have been done using regression analysis with mode wise traffic as dependent variable and weighted income as independent variable. The point to point and trend line actual elasticity between GSDP and traffic is presented in **Table 3-4**.

Period/Modes	CJV	LCV/MBus	Bus	2A	MAV
TP01-Vikravandi					
YOY Elasticity					
FY16 vs FY15	1.8	1.4	-1.7	4.2	0.6
FY17 vs FY16	0.2	-0.5	-0.8	-3.8	-0.8
FY18 vs FY17	1.0	-1.0	0.3	-0.7	-0.5
FY19 vs FY18	0.2	1.1	-0.5	-1.9	-0.2
FY20 vs FY19	1.7	2.1	-0.4	-3.5	0.0
FY21 vs FY20	-7.1	-63.3	-412.4	41.7	-15.8
FY22 vs FY21	0.4	-0.3	4.7	0.5	0.5
FY23 vs FY22	2.5	1.3	5.7	2.0	0.7
Trend Line Elasticity					
FY15 vs FY23	0.8	0.0	-1.4	-0.9	-0.2
FY17 vs FY23	0.9	0.1	-1.5	-0.5	0.0
FY19 vs FY23	1.1	0.0	-0.7	0.8	0.4
FY20 vs FY23	1.2	0.0	1.1	1.3	0.5

Table 3-4: Actual Past Traffic Elasticity

CJV

- The elasticities and the past growth levels for cars are a result of increasing income levels, increasing vehicle ownership and higher propensity to travel on highways in India due to network level developments and higher levels of service. These levels of growth are likely to continue in the near to medium term since car ownership

levels are still very low and the road network is undergoing continual development. Actual trend line elasticity for the period FY15/ FY20 to FY23 has been varying between 0.8 to 1.2 in the past across the project road. This is partially due to high growth observed between FY15 & FY16 and FY22 & FY23. Point to point elasticity has shown fluctuations every year varying from 0.2 to -7.1.

- It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. CJV elasticity has been considered as 0.6 for the project road up to FY25 and tapered in subsequent years.
- The motorisation levels in India also play an important role in determining car growth. With the increasing car ownership levels, propensity to travel and network level improvements on National Highways, car growth is likely to be at a high rate as witnessed in the recent past. The low motorization rate suggests that there is room for continued growth for many years to come. With the continual increase in motorization rate and improved road network usage by cars for inter-urban travel, car growth is expected to be robust in India

Bus

- Over the years in India there has been a change in passenger's travel mode preferences with increasingly more people shifting from public transport systems towards personalised modes. This has resulted, in general, elasticity of bus traffic/demand to GSDP being lower than unity.
- For future, 0.3 has been adopted for all the toll plaza for the project road and tapered for the rest of concession period.

Trucks

- The switch between MLCV and LCV is being observed across other national highways wherein MLCVs have been gaining importance lately over LCV category. Actual trend line elasticity for LCV in FY15 to FY23 has been negative at the project road toll plaza. For future, 0.2 has been adopted for the toll plaza till the end of concession period
- 2A trucks show a negative elasticity in the past over all the years. In light of these changing freight composition in the automobile industry and giving due consideration to the freight mix on the PR, the elasticity values adopted for 2A trucks are -0.5.
- The elasticity values achieved in the past for 3A/MAV is 0.4-0.5 while comparing FY23 with the recent past years of FY19 and FY20. This is due to the growth witnessed in FY21 & FY22 and FY22 & FY23 prior to which the growth has been negative. As mentioned earlier, this positive growth is an indicator of the legalised sand mining in the state of Tamil Nadu. In case of MAV, an elasticity of 0.3 has been adopted till the end of concession.

It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. With the anticipated growth momentum in the coming years, higher elasticity values have been considered in the initial slabs for cars and further tapering has been done in the future slabs.

In India as a whole, the freight vehicle mix has been changing in the last decade favouring MAV to 2 Axle/ 3 Axle vehicles for long-distance traffic, given the operational efficiencies achievable with larger vehicles. Considering the ongoing technical advancements in automobile industry, some of the standard 2 Axle/ 3 Axle trucks would gradually be replaced by MAVs. Mature national highways with tolling in operation for few years, have already witnessed the shift in 2A/3A trucks to MAV for long distance movement. As per the latest industry trends, there is a shift happening between various categories of MAVs also - 4A, 5A and 6A and above. 4A trucks are likely to see a replacement soon to 5A and above axle trucks which can carry more tonnage as compared to 4A trucks.

On an overall level, due consideration has been given to the tonnage shifts happening in the market with Mini LCV gaining importance for short distance movements over LCVs and MAVs being preferred over 2A/3A for long distance movements due to better operational efficiencies. Some of the 2A/3A trucks are also being used for local movements.

Giving due consideration to the growth momentum being witnessed in the immediate past, higher elasticity values have been considered for the slab up to FY25 and further tapering has been done in the next slab. The recommended elasticity values adopted for all vehicle types in line with the past traffic data and changes in freight traffic pattern observed on the project road are presented in **Table 3-5**.

Period/ Modes	Car/MLCV	LCV/MBus	Bus	2A	MAV
Up to 2025	0.6	0.2	0.3	-0.5	0.3
Beyond 2025	0.5	0.2	0.3	-0.5	0.3

Table 3-5: Recommended Elasticity for Project Road

3.9 Projected Traffic Growth Rates

Based on the perspective elasticity values and the projected growth rates of the income for PIA states, the future average annual compound traffic growth rates by vehicle type have been estimated for the project road by using the following relationship:

Tgr = (GSDPgr) x E

where,

Tgr – Traffic growth rate for mode

GSDPgr – Growth rate of GSDP

E – Elasticity value for mode

The estimated traffic growth rates for the project road have been presented in **Table 3-6**.

FY End/ Mode	Car/ MLCV	LCV/ Mini-Bus	Bus	2A	MAV
2024	4.5	1.5	2.3	-3.8	2.3
2025	4.5	1.5	2.3	-3.8	2.3
2026	3.8	1.5	2.3	-3.8	2.3
2027	3.8	1.5	2.3	-3.8	2.3

Table 3-6: Projected Traffic Growth Rates for PIA (%)

In derivation of above growth rates, the likely shift of buses to cars in case of passenger vehicles and the replacement/ tonnage shift of LCV/2A/3A trucks by Mini LCV for short distance and MAV for long distance in case of freight vehicles has been duly considered.

3.10 Traffic Projections and Capacity Analysis on PR

Table 3-7 presents the projections of the tollable vehicles at the toll plaza on the project road using the above traffic growth rates till the end of concession as assessed in this study.

FY Ending March	TP01
2023	51,380
2024	52,626
2025	53,932
2026	55,138
2027	56,412

Table 3-7: Total Traffic Projections in PCUs at the Toll Plaza (including Exempt)

The concession agreement for the project does not mention any guidelines related to design capacity and augmentation options for the project road. However, as per IRC guidelines the designed capacity for 4 lane road is 60,000 PCU. In terms of the designed capacity of the project road, the traffic projections are not reaching 60,000 PCUs in the concession period.

4. TOLL REVENUE PROJECTIONS

4.1 Tolling Strategy

The project road has an "Open System" of toll collection which enables the concessionaire to collect tolls from through traffic as well as from short distance one.

As per the Schedule R of the Concession Agreement, there is one operational toll plaza at km 149.200 (TP01) with tolling length of 72.90 km.

4.2 Schedule of User Fee

As per Schedule of User Fee (Schedule R) of Concession Agreement for the project, the per km toll rates applicable from 2007/08 for normal tolling length and permanent structures, the revision basis and concessions are provided.

The concessions to traffic have been given in the form of rates as below:

Local traffic - Car

Car / Jeep / Vans - includes local users owning a vehicle registered for non-commercial purposes, residing within a distance of 10 km from the toll plaza and crossing the same for commuting purposes. The discounted fee for these users shall be a monthly pass of Rs. 150.00. The local users who are residing within a radius of more than 10 km but upto 20 km of the toll plaza location, the discounted fee for these users shall be a monthly pass of Rs.300.

Local Traffic - LCV/Trucks (Local Transport Operators)

Concessional fee shall be from local transport operators on production of proof for plying within 20 km i.e., good challan for origin and destination clearly specifying the return details of the vehicle. The fee for such transport shall be Rs.25 for trucks for each entry and Rs.15 for LCV for each entry. No such concession shall be provided, if a service road or alternative road is available for use by such commercial vehicles.

Local traffic – School bus

Monthly passes for school buses for school students crossing toll plaza for commuting purpose. The discounted fee for these users shall be a monthly pass of Rs.1,000.

Daily Pass

When the vehicle has to cross the tolled section more than once in a day, the user shall have the option to pay one and half times (1.5 times) of the fee for a single entry; this pass shall be valid for 2 entries within 24 hours of purchase.

Monthly Pass

A user, who makes use of the project road frequently during a month, may opt to purchase a monthly pass upon payment of a charge equal to two-thirds of the fee payable

for 30 single journeys; this pass can be used for a maximum 30 one-way journeys over the month of validity.

Thus, the different categories of toll tickets are as follows:

(i) Traffic paying normal toll rates (single trip)

(ii) Traffic paying return journey rates

(iii) Traffic paying monthly pass rates

(iv) Traffic paying local personal rates

(v) Traffic paying local commercial rates

4.3 Tolling Streams

The tolling stream distribution has been derived from the toll plaza data and the average of the distribution from FY23 adopted for the present study is presented in **Table 4-1**.

Ticket Type/Modes	Car	LCV/Mini-Bus	Bus	Truck	MAV
Normal Toll	57.5	57.9	9.2	42.5	74.2
Daily Pass	33.3	39.8	58.9	56.1	25.6
Monthly Pass	0.0	1.4	31.7	0.9	0.1
Local Concessions/SC bus					
Car 10 km	4.0				
Car 20 km	0.0				
Exempt	5.2	0.9	0.2	0.5	0.1
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 4-1: Tolling Distribution for the PR Including Exemptions and Violations (in %)

The paying traffic for the year FY23 has been worked out by deducting the toll exempt percentage from total AADT and is presented in **Table 4-2**.

Toll Plaza/Mode	Car	LCV/Mini-Bus	Bus	Truck	MAV	PCU
AADT	19,688	1,926	3,265	1,842	2,996	51,398
Percentage of exemptions and violations	5.2%	0.9%	0.2%	0.5%	0.1%	
Paying traffic	18,664	1,909	3,259	1,833	2,992	50,288

Table 4-2: Toll Paying Traffic, FY23

The tolling stream distribution excluding exemptions and violations from paying traffic in presented in **Table 4-3**.

Ticket Type/Modes	Car	LCV/ Mini-Bus	Bus	Truck	MAV
Normal Toll	60.7	58.4	9.2	42.7	74.3
Daily Pass	35.2	40.1	59.0	56.4	25.6
Monthly Pass	0.0	1.5	31.7	0.9	0.1

Ticket Type/Modes	Car	LCV/ Mini-Bus	Bus	Truck	MAV
Local Concessions/ SC bus	0.0	0.0	0.0	0.0	0.0
Car 10 km	4.2	0.0	0.0	0.0	0.0
Car 20 km	0.0	0.0	0.0	0.0	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Table 4-3: Tolling Distribution for the PR Excluding Exemptions and Violations (in %)

The normal toll paying traffic for cars is about 60.7 percent at the toll plaza location. Daily pass is in double digits in all the modes. Almost 59.0 percent of the Bus category is opting for daily pass and around 32 percent of buses are falling in the monthly pass category.

Normal toll paying percentage is high (74.3 percent) in MAV (3A/MAV) especially larger axle vehicles which are more likely to ply on long distances. Around 25.6 percent of 3A/MAV trucks may fall in daily pass category at the toll plaza location. The long-distance OD pairs in 3A/MAV are Chennai to Ulundurpet/ Trichy and beyond.

Given the Schedule of User Fee cap on multiple entries with a single monthly pass, a trip rate of 1.8 – 4.5 trips per day as derived from toll plaza data for all vehicle types has been considered at the toll plaza location. For daily pass with multiple entries in a day, a trip rate of around 2.05 - 2.52 has been considered as derived from the toll data.

4.4 Toll Rates

This section presents details on the toll rates that are likely to be imposed on the users of the project road during the concession period. The toll rates (Rs/km) for the base year 1997 for different vehicle categories as per concession agreement are presented in **Table 4-4**.

Mode	Base rate per km (in Rs)
Car, Jeep, Van, LMV	0.4
Light Commercial Vehicle (LCV)	0.7
Bus, Truck	1.4
MAV (>2 Axle)	2.3

Table 4-4: Toll Rates in Rs/km for Different Vehicle Categories

The CA states that the applicable base rates shall be revised annually with effect from September 1 each year to reflect the increase in wholesale price index for the month of March of the immediately preceding year in which sub revision is undertaken.

Actual WPI information for March 2022 of 148.0 under 2011/12 series converted into 1993-94 series (454.892) has been used. The forecast for WPI as provided by the client has been used for the period till the end of concession period and is presented in **Table 4-5**.

March in FY	Applicable for Sept in FY	WPI Forecast
2023	2024	3.7
2024	2025	4.4
2025	2026	4.8
2026	2027	5.0

Table 4-5: WPI Forecast for Toll Rate Indexation

The stream of toll rates to be charged at the toll plaza is presented in **Table 4-6**. The toll fee has been rounded to nearest 5 Rupees as per Schedule R of the concession agreement.

September in FY Ending March	Car / Jeep	LCV	Bus/ Truck	MAV
2023	100	175	355	355
2024	105	185	365	365
2025	110	190	380	380
2026	115	200	400	400
2027	120	210	420	420

Table 4-6: Toll Rates at Toll Plaza (in Rs)

The users purchasing return journey tickets will pay 1.5 times the above toll rates; the traffic opting for monthly passes will pay 33.3 times (two-thirds of 30 single journeys) the normal traffic toll rates. All monthly passes have been rounded to the nearest 5 Rupees as per concession agreement; however, all the rates of local passes (car, LCV and school buses) have been kept constant in line with the current practice.

4.5 Projected Tollable Traffic

The projected toll paying traffic in PCUs (excluding exemptions and violations) based on traffic growth rates till the end of concession as assessed in this study is presented in **Table 4-7**.

FY Ending March	Tollable Traffic in PCU
2023	50,270
2024	51,469
2025	52,727
2026	53,891
2027	55,120

Table 4-7: Projected Toll Paying Traffic in PCUs at the Toll Plaza

4.6 Toll Revenue Estimates

The concession period for the project road is 20 years from the appointed date (the date financial close is achieved). Toll revenue realised for FY23 is Rs 1,637.2 million.

Toll revenue streams have been calculated assuming that:

- Toll would be collected for all 365 days in a year; however, for leap years, 366 days have been used
- Appointed date is October 2006
- As per the revised concession end date, tolling will terminate on 28th February 2027 (original concession end date is 15th October 2026). However, toll revenues have presented for full year of FY27.

A mode wise breakdown of the revenue streams is also presented for the project in **Table 4-8**.

FY Ending March	Car / Jeep	LCV	Bus	School Bus	Truck	MAV	Total
2023 (Actual)	566.3	103.6	250.2	0.0	176.0	541.0	1,637.2
2024	635.6	112.9	271.7	0.0	184.1	597.0	1,801.3
2025	695.0	118.7	288.7	0.0	183.5	632.9	1,918.7
2026	753.8	125.7	308.5	0.0	184.8	676.8	2,049.7
2027*	817.7	134.1	330.8	0.0	186.6	725.5	2,194.7

-presented for full year of FY27

Table 4-8: Toll Revenue (in Rs million) for Project Road by Mode

Cars represent a share of around 36.1 percent in total revenue. LCV/Mini-bus and bus have a share of 6.2 percent and 15.1 percent respectively. Amongst the freight vehicles category, MAVs represent the highest share of around 33 percent of total revenue. 2A trucks have a share of 9.5 percent.

While in case of ticket wise revenue collection, vehicles paying normal tolls are around 63.6 percent of total toll revenues for the project road and around 31.9 percent of the traffic may opt for daily pass category. Remaining 4.5 percent may fall in monthly pass and local concession category.

The project road has a revenue CAGR of 7.6 percent during the tenure of concession.

APPENDICES

APPENDIX 2.1
TRAFFIC ZONING SYSTEM

Traffic Study for Tindivanam-Ulundurpet Section of NH-45 in the State of Tamil Nadu

Traffic Zoning System

Zone	Place/Region	District/ State	State
1	Tindivanam	Project Corridor (Viluppuram/Kallakurichi Districts)	Tamil Nadu
2	Jaganpet/ Thenpasiyar		
3	Kutteripattu/ Mailam/ Chendur		
4	Chittani/ Salai/ Vikrabandi/ Palapattu		
5	Kurinchipadi/ Panapakkam/ Pappanapattu/ Panayapuram		
6	Mundiampakkam		
7	Villupuram		
8	Pedagam/ Perangiyur/ Iruvelpallu		
9	Arasur/ Sithanangur/Madapattu		
10	Mettathur/ Semmanandal/ Sengurichi		
11	Ongur/ Olakkur/ Saram	Rest of Villupuram/Kallakurichi Districts	Tamil Nadu
12	Nattarmangalam/ Deevanur		
13	Gingee/ Valathi/ Avalurpettai/ Senjipudur/ Alampudi		
14	Marakkanam/ Koonimedu/ Pinnagrazai		
15	Kondamur/ Kiliyanur/ Auroville		
16	Eriyayur/ Nemili/ Vanur		
17	Valavanur		
18	Kallipattu/ Arasamangalam/ Poovarasankuppam/ Malavarayanur		
19	Ulundurpet/ Ulundurpettai		
20	Thirukoilure/ Sandapet		
21	Arakandanallur/ Athandamarudur		
22	Sankarapuram/ Kallakkurichchi/ Madur/ Kadambur/ Keeranur/ Kanai		
23	Thirubhubanai	Puducherry	Puducherry
24	Karaikal		
25	Puducherry or Pondicherry (Kirmambakkam/Ariyankuppam/Kaluperumbakkam)		
26	Kanchipuram	Kanchipuram	Tamil Nadu
27	Thiruvanmiyur/ Muttukadu/ Kovalam/ Tirukkalukundram/ Mahabalipuram (Coastal Kanchipuram Places)	East Kanchipuram District	
28	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	North & South Kanchipuram District	
29	Uttirmerur/ Mangalam/ Palur/ Magaral/ Walajabad/ Sriperumbudur	West Kanchipuram District	
30	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Chennai District	
31	Chennai Port		
32	Tiruvallur/ Redhills/ Ennore Port/ Kattupalli Port/ Ponneri/ Gummidipundi/ Uttukkotai/ Palipattu/ Tiruttani/ Avadi/ Thiruverkadu/ Tiruvottriyur	Tiruvallur District	
33	Vellore/ Walajpet/ Arrakkonam/ Arcot/ Katpadi/ Gudiyattam/ Vaniyambadi/ Ranipet	Vellore District	
34	Cheyyar/ Vandavasi/ Manampathi/ Marudadu	East Tiruvannamalai District	
35	Arani/ Polur/ Tiruvannamalai/ Chengam/ Chetpet	North/South&West Tiruvannamali District	
36	Cuddalore/ Karaikkadu/ Puduchatiram/ Kattymannarkudi	East Cuddalore District	
37	Kandarakottai	North & South Cuddalore District	
38	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram		
39	Vriddhachalam/ Tittagudi/ Tallanallur/ Kammapuram/ Mangalam/ Nallur/ Puvanur	West Cuddalore District	
40	Krishnagiri (Hosur)/ Dharmapuri District	North West Tamilnadu Districts	
41	Salem/ Attur/ Vazhapadi/ Mettur	Salem District	
42	Perambalur	Perambalur District	
43	Tiruchchirappalli (Trichy)	Tiruchchirappalli District (Trichy District)	
44	Ariyalur	Ariyalur District	
45	Thanjavur/ Thrivarur/ Kumbakonam	South East Tamilnadu Districts	
46	Madurai	Madurai District	
47	Niligris/ Erode/ Coimbatore/ Nammakal/ Tiruppur/ Karur/ Pollachi	West & Central Tamilnadu Districts	
48	Dindigul/ Theni/ Palani	South West Tamilnadu Districts	
49	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	South Tamil Nadu	
50	Ramanathapuram/ Sivaganga/ Pudukkotai Districts		
51	Nellore (Krishnapatnam port)/ Ongole/ Prakasam/ Guntur/ Vijayawada/ Godavari/ Vishkhapatnam/ Vizayanagaram/ Srikakulam	Eastern Andhra Pradesh Districts	Andhra Pradesh
52	Chittoor (Tirupathi)/ Srikalahasti/ Sri City	South Andhra Pradesh	
53	Cuddapah/ Kurnool/ Anantapur/ Nandyala	West & South Andhra Pradesh Districts	
54	Hyderabad	Hyderabad	Telangana
55	Mahbubnagar/ Nalgonda/ Nizamabad/ Adilabad/ Karimnagar/ Warangal/ Sangareddy Districts	Rest of Telangana	
56	Kottayam/ Pallakad/ Sabarimala/ Kollam/ Thiruvananthapuram/ Alappuzha Districts	Central part of Kerala Districts	Kerala
57	Ernakulam/Kochi/ Cochin Districts	North West of Kerala Districts	
58	Thrissur/ Mallapuram Districts	Eastern part of Kerala Districts	
59	Kozikode/ Calicut/ Kalpetta/ Kannur/ Kazaragod/ Mahe Districts	Western part of Kerala Districts	
60	Bengaluru/ Kolar/ Chikballapur/ Tumkur Districts	Southern Karnataka Districts	Karnataka
61	Mysore/ Madye/ Madikeri/ Chamrajnagar/ Hassan/ Chikmanglore/ Mangalore/ Udupi/ Shivmor/ Devangiri/ Chitradurga/ Karwar Districts	Western Karnataka Districts	
62	Belur/ Hospet/ Dharwad/ Hubli/ Gadag/ Haveli/ Belgaum/ Bijapur/ Bidar Districts	Northern Karnataka Districts	
63	Nandurbar/ Dhule/ Jalgaon/ Buldhana/ Nashik/ Aurangabad/ Jalna/ Beed/ Pune/ Ahmednagar/ Ratnagiri/ Osmanabad/ Solapur/ Satara/ Ratnagiri/ Sangli/ Kolhapur/ Sidhudurg/ Parbhani and Latur	Western Maharashtra	Maharashtra
64	Mumbai,Thane	Maharashtra	
65	Akola/ Amravati/ Nagpur/ Bhandara/ Gondia/ Gadchiroli/ Chandrapur/ Wardha/ Yavatmal/ Washim/ Hingoli and Nanded districts	Eastern Maharashtra	
66	Goa	Goa	Goa
67	Madhya Pradesh	Central India	Rest of India
68	Chhattisgarh		
69	Jharkhand		
70	Orissa	East India	
71	West Bengal	West Bengal	West Bengal
72	Bihar	East India	Rest of India
73	Uttar Pradesh	North India	
74	Rajasthan	West India	
75	Gujarat		
76	Punjab (Amritsar)	North India	
77	Haryana (Gurugram/Faridabad/Panipat)		
78	Uttarakhand		
79	Jammu & Kashmir/ Ladakh		
80	Himachal Pradesh		
81	Delhi		
82	Assam/ Arunachal Pradesh/ Nagaland/ Manipur/ Tripura/ Sikkim/ Meghalaya	Eastern India	

APPENDIX 2.2
MODE WISE TOP 20 OD PAIRS

Traffic Study for Tindivanam-Ulundurpet Section of NH-45 in the State of Tamil Nadu

Top 20 Origin Destination Pairs at TP01-Vikravandi Toll Plaza

Car/ Jeep

S.No.	Origin	Destination	% of total
1	Villupuram	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	16%
2	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Salem/ Attur/ Vazhapadi/ Mettur	11%
3	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Tiruchchirappalli (Trichy)	8%
4	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Madurai	6%
5	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Niligris/ Erode/ Coimbatore/ Nammakal/ Tiruppur/ Karur/ Pollachi	6%
6	Tindivanam	Villupuram	6%
7	Puducherry or Pondicherry (Kirmambakkam/Ariyankuppam/Kaluperumbakkam)	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	4%
8	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Thanjavur/ Thrivarur/ Kumbakonam	4%
9	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	3%
10	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	3%
11	Chittani/ Salai/ Vikrabandi/ Palapattu	Villupuram	2%
12	Villupuram	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	2%
13	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Dindigul/ Theni/ Palani	2%
14	Sankarapuram/ Kallakkurichchi/ Madur/ Kadambur/ Keeranur/ Kanai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	2%
15	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Cuddalore/ Karaikkadu/ Puduchatiram/ Kattymannarkudi	1%
16	Ulundurpet/ Ulundurpettai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	1%
17	Tindivanam	Salem/ Attur/ Vazhapadi/ Mettur	1%
18	Kutteripattu/ Mailam/ Chendur	Villupuram	1%
19	Tindivanam	Tiruchchirappalli (Trichy)	1%
20	Villupuram	Kanchipuram	1%
		Total	**80%**

Bus

S.No.	Origin	Destination	% of total
1	Villupuram	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	17%
2	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Tiruchchirappalli (Trichy)	11%
3	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Salem/ Attur/ Vazhapadi/ Mettur	11%
4	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Thanjavur/ Thrivarur/ Kumbakonam	7%
5	Tindivanam	Villupuram	5%
6	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	4%
7	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	4%
8	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Niligris/ Erode/ Coimbatore/ Nammakal/ Tiruppur/ Karur/ Pollachi	4%
9	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Madurai	3%
10	Sankarapuram/ Kallakkurichchi/ Madur/ Kadambur/ Keeranur/ Kanai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	3%
11	Villupuram	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	3%
12	Chittani/ Salai/ Vikrabandi/ Palapattu	Villupuram	2%
13	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Dindigul/ Theni/ Palani	2%
14	Puducherry or Pondicherry (Kirmambakkam/Ariyankuppam/Kaluperumbakkam)	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	2%
15	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Perambalur	1%
16	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	Salem/ Attur/ Vazhapadi/ Mettur	1%
17	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	1%
18	Ulundurpet/ Ulundurpettai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	1%
19	Tindivanam	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	1%
20	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	Tiruchchirappalli (Trichy)	1%
		Total	**84%**

Traffic Study for Tindivanam-Ulundurpet Section of NH-45 in the State of Tamil Nadu

Top 20 Origin Destination Pairs at TP01-Vikravandi Toll Plaza

LCV

S.No.	Origin	Destination	% of total
1	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Niligris/ Erode/ Coimbatore/ Nammakal/ Tiruppur/ Karur/ Pollachi	13%
2	Villupuram	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	12%
3	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Tiruchchirappalli (Trichy)	8%
4	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Salem/ Attur/ Vazhapadi/ Mettur	8%
5	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Madurai	8%
6	Tindivanam	Villupuram	5%
7	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	5%
8	Villupuram	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	3%
9	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	3%
10	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Ernakulam/Kochi/ Cochin Districts	3%
11	Chittani/ Salai/ Vikrabandi/ Palapattu	Villupuram	2%
12	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Thanjavur/ Thrivarur/ Kumbakonam	2%
13	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Dindigul/ Theni/ Palani	2%
14	Puducherry or Pondicherry (Kirmambakkam/Ariyankuppam/Kaluperumbakkam)	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	2%
15	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	Salem/ Attur/ Vazhapadi/ Mettur	1%
16	Ulundurpet/ Ulundurpettai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	1%
17	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Cuddalore/ Karaikkadu/ Puduchatiram/ Kattymannarkudi	1%
18	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	1%
19	Sankarapuram/ Kallakkurichchi/ Madur/ Kadambur/ Keeranur/ Kanai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	1%
20	Kutteripattu/ Mailam/ Chendur	Villupuram	1%
		Total	**81%**

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S.No.	Origin	Destination	% of total
1	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Niligris/ Erode/ Coimbatore/ Nammakal/ Tiruppur/ Karur/ Pollachi	12%
2	Villupuram	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	10%
3	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Tiruchchirappalli (Trichy)	8%
4	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Salem/ Attur/ Vazhapadi/ Mettur	8%
5	Tindivanam	Villupuram	8%
6	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Madurai	6%
7	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Ernakulam/Kochi/ Cochin Districts	5%
8	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	4%
9	Chittani/ Salai/ Vikrabandi/ Palapattu	Villupuram	3%
10	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	3%
11	Puducherry or Pondicherry (Kirmambakkam/Ariyankuppam/Kaluperumbakkam)	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	2%
12	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Dindigul/ Theni/ Palani	2%
13	Villupuram	Tambaram/ Vandalur/ Kattankolathur/ Singapperumalkovil/ Chengalpattu/ Madurantakam/ Memalruvathur	2%
14	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Thanjavur/ Thrivarur/ Kumbakonam	1%
15	Tindivanam	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	1%
16	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Ariyalur	1%
17	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Cuddalore/ Karaikkadu/ Puduchatiram/ Kattymannarkudi	1%
18	Ulundurpet/ Ulundurpettai	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	1%
19	Kutteripattu/ Mailam/ Chendur	Villupuram	1%
20	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Ramanathapuram/ Sivaganga/ Pudukkotai Districts	1%
		Total	**80%**

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S.No.	Origin	Destination	% of total
1	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Niligris/ Erode/ Coimbatore/ Nammakal/ Tiruppur/ Karur/ Pollachi	12%
2	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Tiruchchirappalli (Trichy)	11%
3	Villupuram	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	7%
4	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Salem/ Attur/ Vazhapadi/ Mettur	6%
5	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	6%
6	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Ernakulam/Kochi/ Cochin Districts	4%
7	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Madurai	4%
8	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Ariyalur	4%
9	Puducherry or Pondicherry (Kirmambakkam/Ariyankuppam/Kaluperumbakkam)	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	3%
10	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	2%
11	Tindivanam	Villupuram	2%
12	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Thanjavur/ Thrivarur/ Kumbakonam	2%
13	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Dindigul/ Theni/ Palani	2%
14	Nellore (Krishnapatnam port)/ Ongole/ Prakasam/ Guntur/ Vijayawada/ Godavari/ Vishkhapatnam/ Vizayanagaram/ Srikakulam	Ernakulam/Kochi/ Cochin Districts	2%
15	Virudnagar/ Tirunelveli/ Kanyakumari/ Thoothukudi/ Sivakasi/ Tenkasi/ Nagercoil	Nellore (Krishnapatnam port)/ Ongole/ Prakasam/ Guntur/ Vijayawada/ Godavari/ Vishkhapatnam/ Vizayanagaram/ Srikakulam	1%
16	Madurai	Nellore (Krishnapatnam port)/ Ongole/ Prakasam/ Guntur/ Vijayawada/ Godavari/ Vishkhapatnam/ Vizayanagaram/ Srikakulam	1%
17	Chittani/ Salai/ Vikrabandi/ Palapattu	Villupuram	1%
18	Tiruchchirappalli (Trichy)	Nellore (Krishnapatnam port)/ Ongole/ Prakasam/ Guntur/ Vijayawada/ Godavari/ Vishkhapatnam/ Vizayanagaram/ Srikakulam	1%
19	Tindivanam	Panruti/ Thiruvamur/ Kadampuliyur/ Vadalur/ Karunguli/ Kurinkipadi/ Settiyathope/ Neyveli/ Chidambaram	1%
20	Chennai District (Annanagar/ Guindy/ Tondiarpet/ Sembiyam/ Chennai Central/ Parrys)	Cuddalore/ Karaikkadu/ Puduchatiram/ Kattymannarkudi	1%
		Total	**73%**