L&T IDPL

Traffic Advisory services for Krishnagiri - Thoppur section of NH-44 in the state of Tamil Nadu

Final Traffic Report

September 2017

A Joint Venture of The Government of National Capital Territory of Delhi & The IDFC Foundation.
An ISO Certified Company

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This report is prepared based upon work engaged by L&T IDPL Limited. Any opinions, findings, conclusions, or recommendations are based on the data collection exercise during the period of the engagement and do not reflect the views of DIMTS Ltd, its employees or its administration in general.

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CHAPTER 1

Introduction

1. Introduction

1.1 Background

The Govt. of India (GoI) through the National Highways Authority of India (NHAI) has embarked on a program of upgrading existing National Highways to provide a safer, more comfortable and faster journey on the national road network. The NHAI has launched seven phases of National Highways Development Projects (NHDP), of which Phase II consists of upgrading the roads on North-South and East-West corridor.

NH-7 is an important North - South highway which passes through Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh, Karnataka and Tamil Nadu. The section of project road which is the subject of this study starts at Krishnagiri and ends at Thoppur. This is an important section as it is the only major link connecting two important cities of Salem and Bengaluru.

The project road is upgraded as a part of NHDP Phase II. The up gradation of this section is done by L&T IDPL and the project is operational since April 2009. As part of traffic updation exercise for the project of L&T IDPL and its assets, L&T IDPL Limited appointed Delhi Integrated Multi Modal Transit System Limited (DIMTS) as consultant for conducting Traffic Assessment Studies for four portfolio projects including the section of NH-44 connecting Krishnagiri to Thoppur.

1.2 Description of Project Road

The Project Highway takes off from Krishnagiri which is on the outskirts of the town at Km 94 of NH-44 (Previously known as NH-7) and ends at Thoppur junction at Km 180; it is as presented in the Figure 1-1.

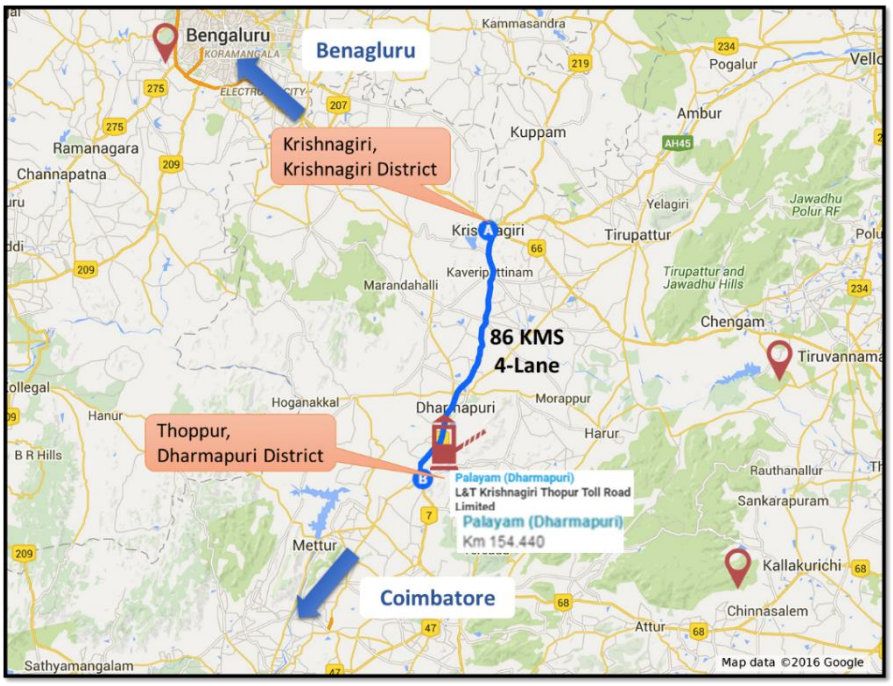


Figure 1-1: Project Road

Krishnagiri district which is an important agricultural and mining based centre. At the other end, Thoppur is a town of Tamil Nadu. There are many small & medium scale industries along the project road. The project road places an important role in connecting these industries to state capital and other regions of India.

1.3 Objective and Scope of Work

The objective and scope of services are as follows:

- To collect and compile relevant secondary information pertaining to the project and project influence area.
- To understand the prevailing traffic nature of the area by analyzing the past studies/traffic data
- To analyze the seasonal variation of traffic
- To study the competitive route and to highlight the opportunities and threat
- Impact of modal shift between different vehicle categories
- To assess the developmental traffic based on the developmental proposals
- Forecast the drivers of revenue during the life of concession
- To recommend the growth rates (vehicle category wise) based on the potential of the project corridor
- Category wise traffic and revenue forecast for entire concession period

1.4 Structure of Report

The report is divided into six chapters, including this introduction chapter. **Chapter 2** contains details pertaining to Project Influence Area characteristics. **Chapter 3** presents the primary and secondary data collected to complete the task. **Chapter 4** covers the particulars regarding the developmental and diverted traffic. **Chapter 5** contains the details on the derivation of traffic growth rates used for traffic forecasting, **Chapter 6** presents the forecasted traffic & revenue for the recommended traffic growth rates.

CHAPTER 2

Project Influence Area Characteristics

2. Project Influence Area Characteristics

2.1 Project Road

National Highway NH- 44 (previously known as NH-7) is a prime arterial of the state and connects to capital of neighbouring state Bangalore city and major districts in Tamil Nadu which are Krishnagiri, Salem and Vellore. It provides a connection to all these areas. The project corridor mainly passes through plain terrain with agriculture as the primary land use around it. Major settlements through which project road passes are Krishnagiri, Dharampuri and Thoppur.

The Project Corridor takes off from a "T" intersection (Thiruvalluvar Nagar) with NH-46. Thereafter, it traverses towards Thoppur. The Project Corridor ends at Thoppur town outskirts at 180Km.

Generally the area which contributes to the total traffic plying on project road is called the project influence area (PIA). PIA is further classified into broad and immediate influence area depending on its distance from the project road. The immediate influence area for the project corridor is Krishnagiri and Salem district through which it passes, whereas entire state of Tamil nadu, Karnataka and Kerala falls under the broad influence area of the project road. The project road with immediate influence area is presented in the figure below.

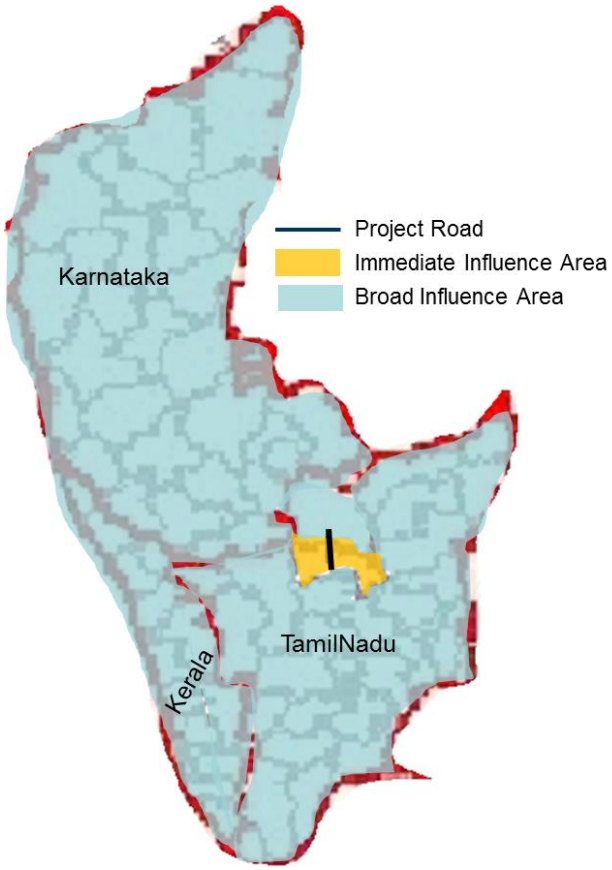


Figure 2-1: Project Corridor Influence Area

Table 2-1: Summary of Project Road

Details of Project Road	
Project road length (km)	86 Km
No of Toll Plazas	1
No of Lanes	4 lane divided
No. of districts along the project road	2
Project Starting Year	2009 April

2.2 Tamil Nadu State

Tamil Nadu, the South Indian State of India nestles in the southernmost tip of peninsular India. The State is bounded by Andhra Pradesh, Karnataka in the north and Kerala in the west. The waters of the Bay of Bengal and the Indian Ocean wash the coastal eastern and southern boundaries respectively. The total geographical area of the State is 1,30,060 square kilometres divided into 5 major physiographic divisions of the Kurinji or mountainous region, the Mullai or forest region, the Palai or arid region, the Marudham or the fertile plains and the Neidhal or coastal region. The densely forested and wild life filled mountain chains of the Western Ghats, plateaus, intensively cultivated farmlands, fertile coastal plains are the geographical features of Tamil Nadu.

The State is divided into 30 Districts, 2001 Talukas and 385 Blocks. There are 16,317 Villages in the State, out of which 917 are uninhabited. According to the 2011 census of India, the total population of Tamil Nadu is 72.1 million of which 36.1 million (50.13%) are male and 36.0 million (49.87%) are female, or 996 females per 1000 males.

Table 2-2: Demographic Profile of the State of Tamil Nadu

Parameters	Tamil Nadu
Capital	Chennai
Principal Language	Tamil
Geographical Area (sq km)	130060 (11th Largest in India)
Administrative Districts (No)	30
Population Density (Persons/sq. km)*	555
Total Population (Million)*	72.1
Male Population (Million)*	36.1
Female Population (Million)*	36.0
Literacy Rate (%)*	80.09%

Source: Census of India 2011

There are 30 districts in the State of Tamil Nadu and the figure below provides the sex ratio in the state of Tamil Nadu.

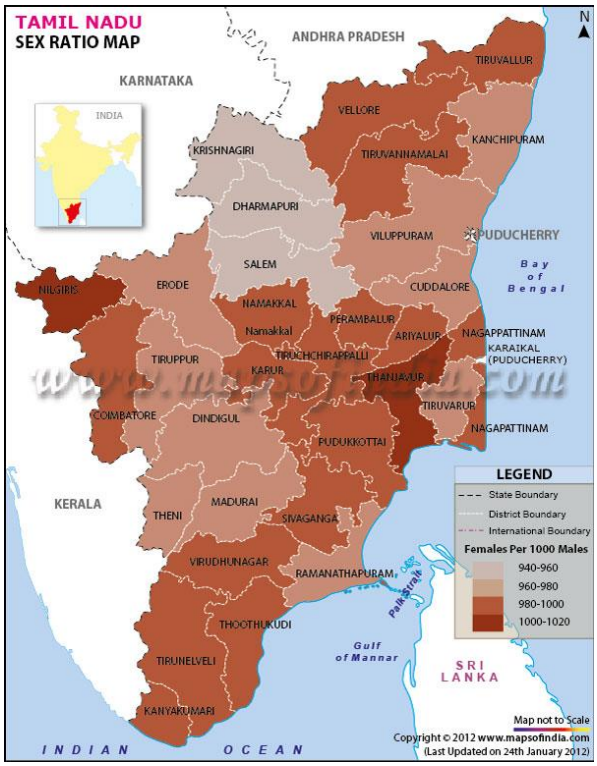


Figure 2-2: Sex Ratio in Tamil Nadu (District wise)

Figure 2-3: Urban Map of Tamil Nadu

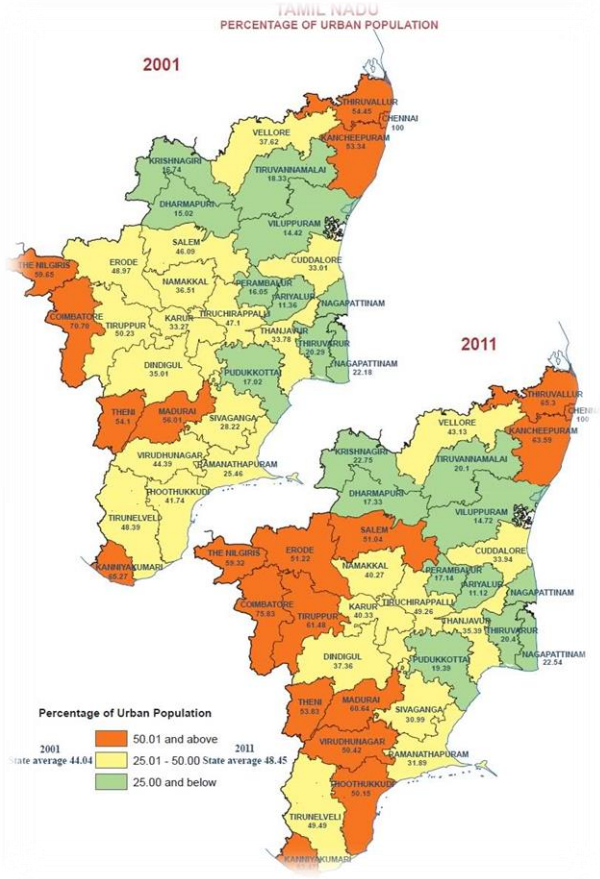


Table 2-3: Profile of Districts & Cities in Project Influence Area

Sr. No	District	Headquarter	Population (2011)	Density (Persons/Sq.Km)	Literacy (%)
1	Salem	Salem	3482056	665	72.86
2	Krishnagiri	Krishnagiri	1879809	367	71.46
3	Bangalore	Bangalore	9621551	4381	87.67

Source: Census of India 2011

2.2.1 Road Network in Tamil Nadu

The state is well connected to neighbouring states and other parts of India by road network of length 146944 Km. The road density in state is 53.42 Km per 100 sq.km of area. In recent years participation of private sector is being encouraged in the construction of highways. The road lengths of different categories of roads are as presented in table below

Table 2-4: Different type of Roads in Tamil Nadu

Road Type	Road Length (Km)
National Highways	4873
State Highways	9384
Major District Roads	11288
Other District Roads	36096
Village Roads	137399

Source: Directorate of economical and statistical office

2.2.2 Industry in Tamil Nadu

With a view to promote the industrial activities, Tamil Nadu is creating a favourable industrial climate in the state by announcing pro-active industrial policies. During 2008-09, the government has signed 12 memorandums of understandings with an investment of Rs.25050 crore and issued structured package sanctioning orders for 7 other projects with an investment of Rs.5462 crore.

The manufacturing sub-sectors of the State economy viz. textiles, wearing apparels, leather, wood products, chemicals, non-metallic minerals, basic metals, software and hardware of IT industries, transport equipment, automobiles have experienced lower production compared to that of the previous year's level due to lower demand and power shortages. The income originated from the manufacturing sector to GSDP increased from Rs.43874 crore in 2007-08 to Rs.44758 crore in 2008-09 and thereby registered a growth of 1.77 per cent but at a decelerated rate when compared to 2006-2007.

At the national level, the industrial scenario of Tamil Nadu continues to retain its position as in the previous year. As per the ASI data 2005-06, Tamil Nadu occupies the first position in having the number of factories and the total number of persons engaged in the industrial process. In respect of all the other principal characteristics, viz. fixed capital, productive capital, gross value of output and net value added, the State retains its third position as in the previous year. At the national level, the State is sharing 15.17 per cent of factories, 9.94 per cent in fixed capital, 14.88 per cent in persons engaged. 9.76 per cent in gross value of output and 8.97 per cent in net value added. The Growth of Industrial Sector, measured by the Index

of Industrial production for the year 2008-09 showed a decelerated growth of 1.7 per cent compared to 5.0 per cent in 2007-08. The manufacturing sub–group also achieved a sub-dued growth of 2.4 per cent as against 5.0 per cent in the previous year. The other two sub-groups viz. mining and electricity had registered a negative growth of 1.2 per cent and 2.3 per cent respectively. At the national level also, the overall growth of industrial production decelerated to 2.4 per cent in the review year from 8.5 per cent achieved in the previous year. A detailed analysis of the rate of growth, investments, employment and projected growth in each segment are given below.

Source: CMIE

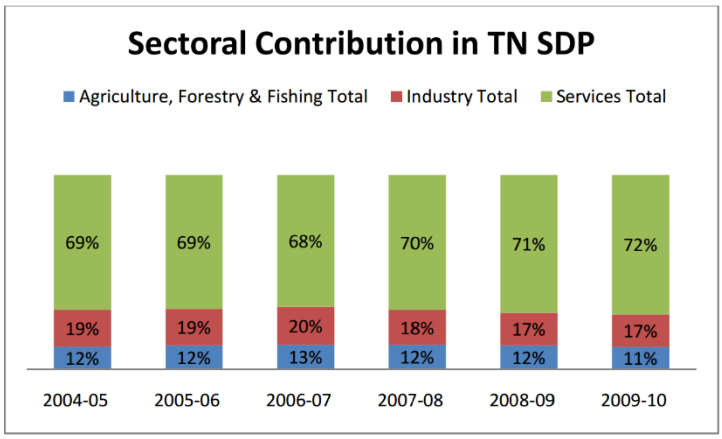


Figure 2-4: CAGR (%) of TN GSDP- Industry during 10th and 11th five year plans

2.2.3 Economy of Tamil Nadu

Tamil Nadu is the second largest contributor to India's GDP. Tamil Nadu's gross state domestic product for the year 2011–2012.

Economic Activity:

- Services- Manufacturing- 34%;
- Services- 45%;
- Agriculture - 21%

A list of the major contributors to the state economy and the leading industries of the state are:

- Agriculture and aquaculture
- Leather Industries
- Textile and Engg Industries
- Automobiles
- Heavy Industries
- Mineral based industries
- Power
- Information and Technology.
- Tourism

Agriculture

Tamil Nadu is gifted with 33 river basins, the largest one's being, Cauvery, Pennalaru, Vaigai and Tamaraparani. Of total area in the state, 59.2% is under cultivation (not including forest

lands). Rice and various pulses are grown extensively here. The annual food grain exceeds 10 million tonnes; with rice alone contributing average 8 million tonnes. The main cash crops grown in the state are sugarcane, tobacco, chillies, and cotton, giving rich scope for the growth and development of the sugar, alcohol-based and textile industries. Other state-sponsored schemes include the large-scale cultivation of spices and oil seeds particularly groundnut, sesame, castor and coconut. Sunflower has become increasingly popular in recent times. The diverse Agro-ecological conditions also make this land ideal for growing fruits and vegetables. The state ranks first in the yield of mangoes and fourth in bananas and grapes.

Industrial role in economy

Traditionally, Tamil Nadu is one of the well-developed states in terms of industrial development. In the post-liberalisation era, Tamil Nadu has emerged as one of the front-runners by attracting a large number of investment proposals particularly in recent times. Today, Tamil Nadu is the third largest economy in India and its 2010-2011 State Domestic Product is well over US $ 23 billion. The salient features of its economy are given hereunder:

Rank of Tamil Nadu among Indian States	
Industrial output	Third
Value addition	Second
No. of factories	Second
Total workers employed in factories	Second
Foreign Direct Investment Flow	Second

With the setting up of major automobile projects namely Ford-Mahindra, Hyundai Motors, Hindustan Motors, Mitsubishi, expansion plans of Ashok Leyland & TAFE, Chennai, emerges as the Detroit of south East Asia. Tamil nadu has always been a fore-runner in the industrial process, both in terms of industrial output and in encouraging various new large scale products. Having recorded an impressive growth in industry in the post-reform span, it is poised for further industrial development and expansion. At present, the state accounts for over 11% of India's industrial output. Tamil Nadu's strength lies not only in its traditional industries, but also in several new emerging industries. In its efforts, to develop a strategy for industrial growth and development, the State Government is concentrating on promoting the development of industries in which the State already has a competitive edge and high impact industries in which advantages can easily be created.

Mineral based industries

The main mineral wealth of the state is granite, limestone and lignite. The availability of different varieties of granite in different parts of the State has resulted in a booming granite industry. Over the year, the granite industry has grown from strength to strength contributing more than 35% of the country's exports. During 1996-97, Tamil nadu exported granite products valued at Rs.4.0 billion and other minerals; Rs.5.10 billion. The current annual production of cement is over 5 million tonnes. Lignite is being used to generate power. Graphite is yet another mineral offering opportunities for down-stream industries.

Leather – based Industries

Tamil nadu has a dominant presence in the leather and leather based industries. The tanning industry in India has a total installed capacity of 225 million pieces of hide and skins of which Tamil Nadu alone contributes an inspiring 70%. The state accounts for more than 505 of the country's export of leather and leather-related products such as shoe uppers, shoes, garments, and so on. Leather exports by the end of the year 1996-97 was us $ 900 million and the ambitious target of US $4 billion for leather related products exports by the year 2004 for the country seem well within each. This translates into exports worth nearly US $2.2 billion from Tamil Nadu – given the major share it has traditionally enjoyed. Rising to the occasion, the state government is geared up to provide attractive incentives and infrastructural support in the form of setting up industrial estates and common effluent treatment plants. Thus Tamil Nadu's substantial share of the leather market in the years to come is ensured.

Tourism

The tourism industry of Tamil Nadu is the second largest in India, with an annual growth rate of 16 per cent. Tourism in Tamil Nadu is promoted by Tamil Nadu Tourism Development Corporation (TTDC), a Government of Tamil Nadu undertaking. According to Ministry of Tourism statistics, 2,804,687 foreign and 111,637,104 domestic tourists visited the state in 2010. The state boasts some of the grand Hindu temples built in Dravidian architecture. The Brihadishwara Temple in Thanjavur and Gangaikonda Cholapuram built by the Cholas, the Airavateswara temple in Darasuram and the Shore Temple, along with the collection of other monuments in Mahabalipuram (also called Mamallapuram) have been declared as UNESCO World Heritage Sites.

Madurai is home to the Madurai Meenakshi Amman Temple. Sri Ranganathaswamy Temple, Srirangam. Tiruchirappalli is the largest functioning temple in the Tamil Nadu, Tiruchirappalli where the famous Rockfort Temple is located, Rameshwaram whose temple walk-ways corridor (Praagarams) are the longest 1.2 km (0.75 mi) of all Indian temples in the world, Kanchipuram and Palani are important pilgrimage sites for Hindus. Other popular temples in Tamil Nadu include those in Chidambaram,Thiruvannaamalai, Tiruvarur, Kumbakonam, Sankarankovil, Srivilliputhur, Tiruttani, Namakkal, Vellore, Karur, Bhavani, Coimbatore, Kanniyakumari.

Tamil Nadu is also home to hill stations like Udhagamandalam (Ooty), Kodaikanal, Yercaud, Coonoor, Topslip, Valparai, Yelagiri and Manjolai. The Nilgiri hills, Palani hills, Shevaroy hills, Kolli Hills and Cardamom hills are all abodes of thick forests and wildlife. Tamil Nadu has many National Parks, Biosphere Reserves, Wildlife Sanctuaries, Elephant and Bird Sanctuaries, Reserved Forests, Zoos and Crocodile farms. Prominent among them are Mudumalai National Park, The Gulf of Mannar Biosphere Reserve, Annamalai Wildlife Sanctuary, Vedanthangal Bird Sanctuary and Arignar Anna Zoological Park. The mangrove forests at Pichavaram are also eco-tourism spots of importance. The prominent waterfalls in the state are Courtallam, Hogenakkal, Papanasam, Manimuthar, Thirparappu, Pykara and Silver Cascade. The Chettinad region of the state is renowned for its palatial houses and cuisine. With medical care in Chennai, Vellore, Coimbatore and Madurai, Tamil Nadu has the largest numbers in Medical tourism in India.

Kanyakumari, the southernmost tip of peninsular India, is famous for its beautiful sunrise, Vivekananda Rock Memorial and Thiruvalluvar's statue built off the coastline. Marina Beach in Chennai is one of the longest beaches in the world. The stretches of beaches from Chennai to Mahabalipuram are home to many resorts, theme parks and eateries.

In terms of value of output of minerals, Tamil Nadu ranks 7th in India in recent years and its share has been increasing. The above figure compares Tamil Nadu with other major states in 2009-10 in terms of percentage share of total value of mineral output in India.

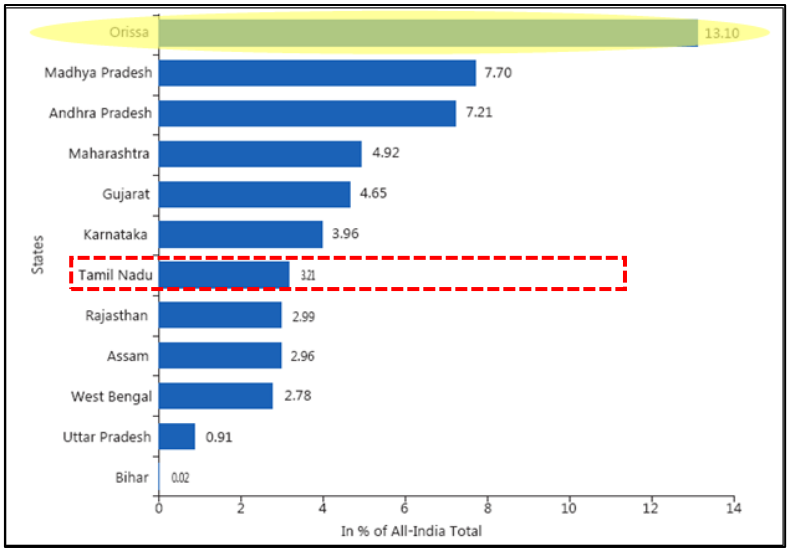
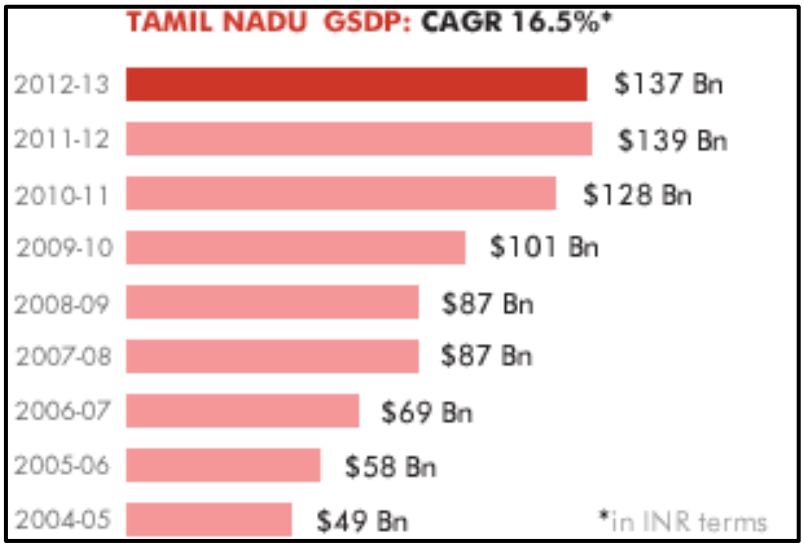


Figure 2-5: Total Value of Mineral Production of Major States, 2009-10

Figure below presents the growth in the state GSDP.



Source: Planning Commission of India, 2013

Figure 2-6: GSDP of Tamil Nadu

2.3 Profile of Districts along Project Road

2.3.1 Krishnagiri District

Krishnagiri district is bounded by Vellore and Thiruvannamalai districts in the East, Karnataka state in the west, State of Andhra Pradesh in the North Dharmapuri District in the south. Its area is 5143 Sq. Km. Tribal like 'Irular' live in the forest of Denkanikottai. As they are away from towns they do not lose their identity and individuality. There people are skilled in tree climbing, honey collection and protecting themselves from wild animals.

This district is connected by Prime Minister's Golden Rectangle Project executed by National Highways Authority of India. This district has a network of National Highways converging.

- NH-7 (Kanyakumari-Varanasi)
- NH-46 (Krishnagiri-Ranipet)
- NH-66 (Pondicherry- Krishnagiri)
- NH-207 (Hosur-Surjapur-Devanhalli-Neelamangala)
- NH-219 (Madanapalli-Kuppam-Krishnagiri)

Apart from this state highways and district highways are linking almost all the towns and villages of the district. Four National highways converge at the Head Quarters of this district is unique. People of Krishnagiri District belong to various racial groups. People from Kashmir, Maharashtra, Karnataka and Andhra have settled in this District. Hence it can be rightly called a Cosmopolitan society. Ancient Art & Culture is preserved and maintained by inhabitants.

"Paradise" is the most popular multi coloured granite available in Krishnagiri. Black granite is available in Hosur and Denkanikottai. Granite processing units, which make slabs of granite, finished and decorated beautifully is located mainly in Hosur surroundings. The multi coloured paradise slabs are being exported to America, England, Australia and some other European countries in large quantities. This industry is flourishing with the uninterrupted supply of electricity and availability of raw material and land at cheaper rates. A variety of quartz stones from Denkanikottai and White metal called Limestone from Uthangarai are mined.

Krishnagiri Reservoir Project, Shoolagiri-Chinnar Reservoir, Thangarai Reservoir, Pambar Reservoir, Kelevarapalli Reservoir Project and Baarur Tank are the sources of irrigation for our district. By all these water reservoirs 18,965 Hectares of land is irrigated.

Table 2-5: Demographic Profile of Krishnagiri District

Sr. No.	Demographic Profile	
1	Share of Land area (%)	3.94%
2	Total Population (No)	1879809
	Rural (No)	1451446
	Urban (No)	428363
3	Literacy (%)	71.46
4	Area (Sq.km)	5129
5	Density (Per Sq.km)	367

Source: Census of India 2011

2.3.2 Salem District

Salem is surrounded by hills and the landscape dotted with hillocks. Salem has a vibrant culture dating back to the ancient Kongu Nadu. As a district, Salem has its significance in various aspects; it is known for mango cultivation, silver ornaments, textile, sago industries and steel production. As of 2011, the district had a population of 3,482,056 with a sex-ratio of 954 females for every 1,000 males.

The Salem handloom industry is one of the most ancient cottage industries and producing quality sari, dothi and angavasthram out of silk yarn and cotton yarn. In the recent past, home furnishing items are also woven, mainly for export purposes. The history of handloom and spinning mills dates back to pre-independence period in Salem. But till 1960's there were only less than 5 spinning mills. Private handloom weaving started thriving in the region along with the large scale cooperative sector handloom weaving and marketing units.

Salem Steel Plant, a special steel unit of Steel Authority of India Ltd have their plant located in Salem which produces Cold rolled stainless steel and Hot rolled stainless steel/carbon steel. The plant can produce austenitic, ferritic, martensitic and low-nickel stainless steel in the form of coils and sheets with an installed capacity of 70,000 tonnes / year in Cold Rolling Mill and 1,86,000 tonnes / year in Hot Rolling Mill. In addition, the plant has country's first top-of-the-line stainless steel blanking facility with a capacity of 3,600 tonnes / year of coin blanks and utility blanks / circles.

Expansion and modernisation of Salem Steel Plant is presently on. The plan envisages installation of Steel Melting and Continuous Casting facilities to produce 1,80,000 tonnes of slabs along with, expansion of Cold Rolling Mill complex, enhancing the capacity of Cold Rolled Stainless Steel Products from 65,000 TPA to 1,46,000 TPA and an additional Roll Grinding Machine for Hot Rolling Mill for increasing production to 3,64,000 TPA. The total project area is 1130 acres and cost of the project is 1780 crores

Table 2-6: Demographic Profile of Salem District

Sr. No.	Demographic Profile	
1	Distribution of Land area (%)	4.02%
2	Total Population (No)	3482056
	Rural (No)	1707934
	Urban (No)	1774122
3	Literacy (%)	72.86
4	Area (Sq.km)	5237
5	Density (Per Sq.km)	665

Source: Census of India 2011

2.3.3 Bangalore District

Bangalore district in its present shape has come into existence in August, 1986 consequent on formation of a new District. It is located in south eastern part of Karnataka. It is spread across four taluks Bangalore north, Bangalore east, south and Anekal. It is a hub for bio-technology, aerospace and key knowledge industries. It is also called as Silicon Valley.

Table 2-7: Demographic Profile of Bangalore District

Sr. No.	Demographic Profile	
1	Distribution of Land area (%)	0.08%
2	Total Population (No)	9621551
	Rural (No)	871607
	Urban (No)	8749944
3	Literacy (%)	87.67
4	Area (Sq.km)	2196
5	Density (Per Sq.km)	4381

Source: Census of India 2011

The District is ranked as one of the top Five Technology Clusters in the world. Bangalore, home to the biggest bio cluster 'Bangalore Helix', has 183 out of 340 Biotechnology companies existing in the country, making it 60% of the Biotechnology Units. Aviation has been the major sector for employment in the district since the 1940's. The country has 5 major research and development centers for Aerospace. The district has the potential to become a Research and Development Hub. The World Economic Forum classified Bangalore as the Innovation Cluster. Mercer's Index ranks Bangalore as the best place to 'live and work' by Expatriates. The District is also slowly becoming a 'Medical Hub' due to the presence of World's largest 'healing center' and 'telemedicine center'.

2.4 Chennai Port – Connectivity

Chennai Port, formerly known as Madras Port, is the second largest container port of India, behind the Nhava Sheva Port, and the largest port in the Bay of Bengal. Strategically located and well connected with major parts of the world, it is today the hub port on the Indian subcontinent.

Chennai Port is the third oldest and about 135 years old port among the twelve major ports of India. It has the strategic advantage of having the entire South India as its hinterland and is emerging as a hub port in East Coast of India. Port location is on the flat eastern coastal plain. The location advantage enables the port to handle variety of cargo comprising containers, liquid & break bulk cargo. The major commodities handled in the Port are Crude oil & POL products, Containers, Automobiles, Edible oil finished Fertilizers, Fertilizer Raw Materials, and general cargo.

It currently handles more than 50 MTPA (2015-16) of traffic and is situated strategically and well connected both by rail and road to serve the hinterlands of Tamil Nadu, Southern Andhra Pradesh and Southern Karnataka.

Road Connectivity: Chennai is well connected to other major cities through national highways. It is connected to Kolkata through NH 5, to Mumbai through NH 4 and to Kanyakumari through NH 45. In general traffic handled by road network is 66%.

CHAPTER 3

Primary and Secondary Data Collection

3. Primary and Secondary Data Collection

3.1 General

As a part of the Traffic forecast study for L&T IDPL Portfolio project of Krishnagiri- Thoppur, extensive data collection both primary and secondary to develop base data was carried out. The main objective is to understand the present traffic situation based on the data provided by the client and also Primary surveys carried out by the consultant to highlight the future threats (if any) based on our study and to finally recommend a suitable growth rates for traffic forecast. The data collection included the primary surveys in the field and the secondary data collection from various sources on site and the data available in public domain. This chapter presents the details of traffic surveys, the locations, and the findings of the primary surveys carried out.

3.2 Site appreciation

To achieve the project objectives, site appreciation including the roads in the project area vicinity were carried out under the supervision of our senior traffic engineers.

A detailed reconnaissance survey was conducted to identify the potential threats and opportunities for the project road. The following points were taken into consideration, while carrying out the site appreciation:

- Major traffic generators and routes
- Interactions with truckers along the project road
- Interactions with truckers in the vicinity of project road
- Travel pattern of the road users at the toll plaza locations and
- Probable diversion routes based on site recon survey.

3.3 Past traffic trends

Past traffic trends were derived based on the past traffic data provided by the “Client” at the toll plaza location on the project road has been in presented in the table below. Also traffic count summary and composition from the traffic surveys carried out as part of this traffic study is also provided in the following sections.

Table 3-1: Traffic Volume Count at Palayam Toll Plaza

Year	Car	Bus	LCV	2A	3A	MAV	AADT
FY 2005	1568	1241	534	3893	2520	148	9904
FY 2009	2903	1013	1078	1954	2872	516	10336
FY 2010	4069	1493	2071	2203	3239	582	13658
FY 2011	5252	1675	2707	2232	3482	625	15974
FY 2012	6182	1736	3157	2174	3189	1058	17496
FY 2013	7787	1707	2248	2183	3275	1086	18286
FY 2014	8046	1669	2002	2473	2781	1346	18317
FY 2015	8633	1641	2070	2725	3579	1731	20380
FY 2016	10304	1746	2162	2456	2685	2528	21883
*FY 2017	11320	1764	2237	2335	2924	2753	23333
**FY 2018	12973	2056	2500	2051	2698	2820	25098

Source: Toll Plaza data, *FY 2017 adjusted for Demonetisation impact, **AADT estimated from Apr’17 to Aug’17 traffic data

Traffic Composition

It has been observed that there is positive growth in traffic for each financial year at the toll plaza location. It can be observed that the numbers of 2 axle trucks and 3 Axle trucks are reducing and Multi Axle Trucks are increasing.

The composition of different modes (Apr'17 to Aug'17 traffic data estimated for FY 2018) at toll plaza location is as presented below.

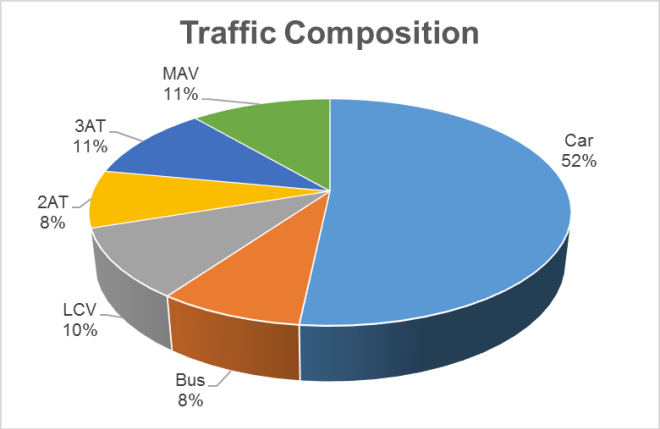


Figure 3-1 Traffic Composition at Palayam Toll Plaza in FY 2018

Traffic counts have been carried out on alternative routes (SH-18) to assess the threat of these roads to project road.

3.4 Secondary Traffic Data and Analysis

As part of the study DIMTS had conducted the OD surveys at the Toll Plaza Location in the month of June 2016.

The major contributing zones at Toll Plaza location is as shown below.

Table 3-2: Region wise zone contribution

Region	Pass.	Goods
Krishnagiri	14.3 %	12.52 %
Dharampuri	9.63 %	6.98 %
Salem District	26.53 %	18.64 %
Rest of Tamil Nadu	17.98 %	21.96 %
Karnataka	23.10 %	19.17 %
Kerala	5.66 %	10.13 %
Andhra Pradesh	2.14 %	3.83 %
Mumbai,Pune	0.25 %	3.10 %
Delhi, Haryana	0.06 %	0.75 %

It can be observed from the above table that mainly the traffic is from the Salem, Rest of Tamil Nadu & Karnataka along the project corridor at the toll plaza location. More than 95% of

passenger traffic and ~90% of freight traffic is from Tamil Nadu, Karnataka and Kerala. Thus, the main project influence regions are Tamil Nadu, Karnataka and Kerala.

The distribution of Major commodity at Palayam Toll Plaza location is as presented below

Table 3-3 Commodity share of Freight Traffic Both Direction at Palayam Toll Plaza

Commodity	Both Directions				
	Mini LCV	LCV	2-Axle	3-Axle	MAV
Empty	41.6%	31.7%	28.1%	23.0%	19.2%
Vegetables/Fruits/Milk	15.5%	14.1%	5.5%	4.8%	4.3%
Fish/chicken/meat/eggs	1.3%	1.4%	0.5%	0.6%	0.3%
Food Grains like Pulses etc	7.9%	6.7%	7.9%	9.2%	9.4%
Sand/Aggregate/Steel/Aluminium/Husk	1.9%	3.3%	6.6%	7.2%	6.4%
Marbles/tiles/lime stone	0.0%	1.6%	2.8%	3.3%	4.2%
Iron coils/Steel bars/iron Pipes	1.1%	1.7%	1.1%	2.2%	3.3%
Petroleum Products (Diesel, Gas etc.)	1.4%	2.3%	4.8%	4.7%	4.1%
Machines/mechanical parts	1.1%	0.9%	0.6%	0.8%	1.4%
Cement	2.4%	2.3%	3.4%	5.8%	8.7%
Courier/Parcel	15.6%	17.5%	19.8%	17.0%	16.4%
Automobiles	0.3%	1.4%	4.5%	4.0%	6.1%

Observations:

- The analysis shows that majority of the trucks carry Parcels, Vegetables, food grains and Automobiles.
- LCVs are being used predominantly for transporting parcels and vegetables.
- 2-axle & 3-axle trucks are being used primarily for transporting parcels, vegetables and Petroleum products and Food grains
- 4-6 axle trucks are used to carry mainly Parcel, Petroleum Products, Automobiles and sand/aggregate
- Reasonable number of trucks are plying empty.

3.5 Primary Surveys and Data collection

Primary data pertaining to the project corridor is provided by the client from their past studies. This includes the classified volume count data and the travel pattern data for different modes of vehicles on the project corridor and competing Routes.

In addition to this DIMTS have carried out Origin and destination (O-D) survey and Traffic Volume Count (TVC) on alternative road network (SH18) to understand the traffic pattern and possible diversions. The findings from the data are summarized in the following sub sections.

The traffic survey locations and schedule is given in following table

Table 3.4: Traffic survey locations and schedule

Type of Survey	Location/Road Name	Survey Dates
3 day TVC & 1 day OD	SH-18, b/w Harur - Salem	3rd - 5th May 2017 (TVC) & 5th May 2017 (OD)

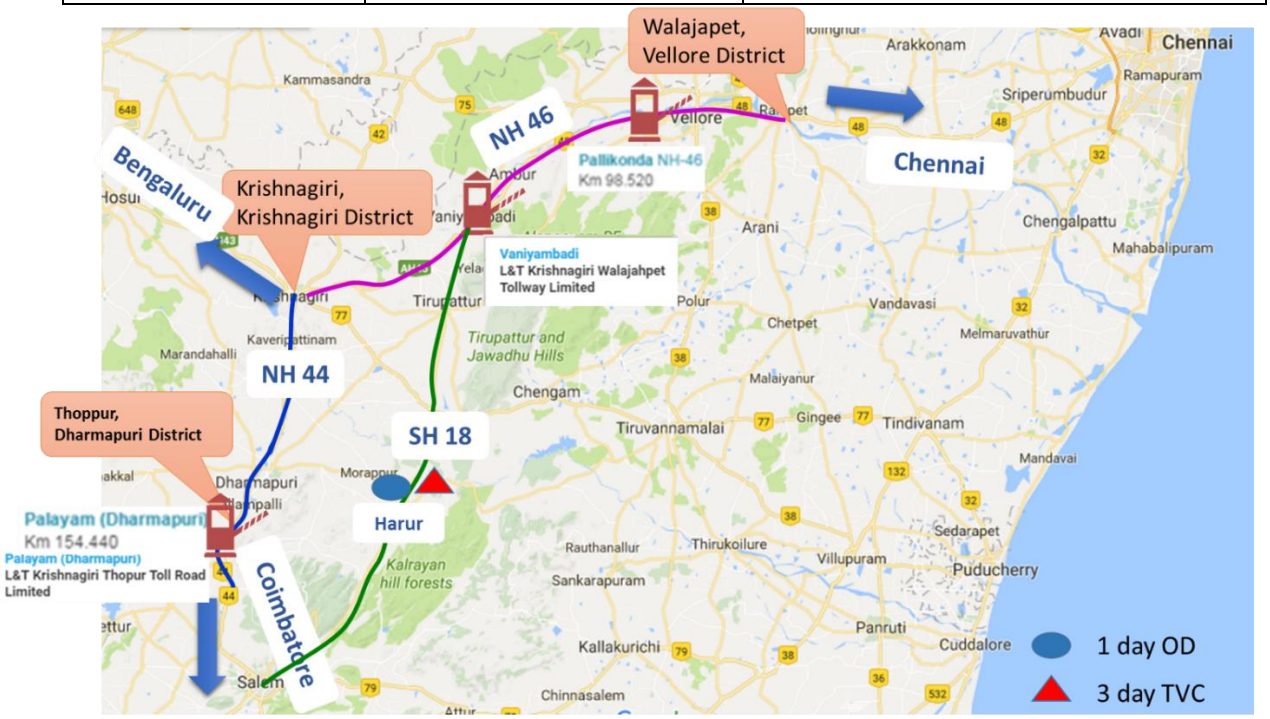


Figure 3-2: Map indicating Surveyed location

3.5.1 Classified Traffic Volume count on Alternative Road – SH18

Traffic Volume counts have been conducted on alternative routes which may be future threats to the project road. 3 days (24*7) Traffic counts have been conducted on SH18 between Harur and Salem. The details of the traffic characteristics have been given below.

SH-18 (b/w Harur & Salem)

SH-18 is one of the main corridor traversing parallel to the project corridor. TVC and OD has been conducted on this road. The average daily traffic plying on this road was 11160 vehicles (14,645 PCU).Directional split at this location was 5733 Veh (Salem to Harur) and 5427 Veh (Harur to Salem). The hourly variation of traffic at this location is shown in the following figure.

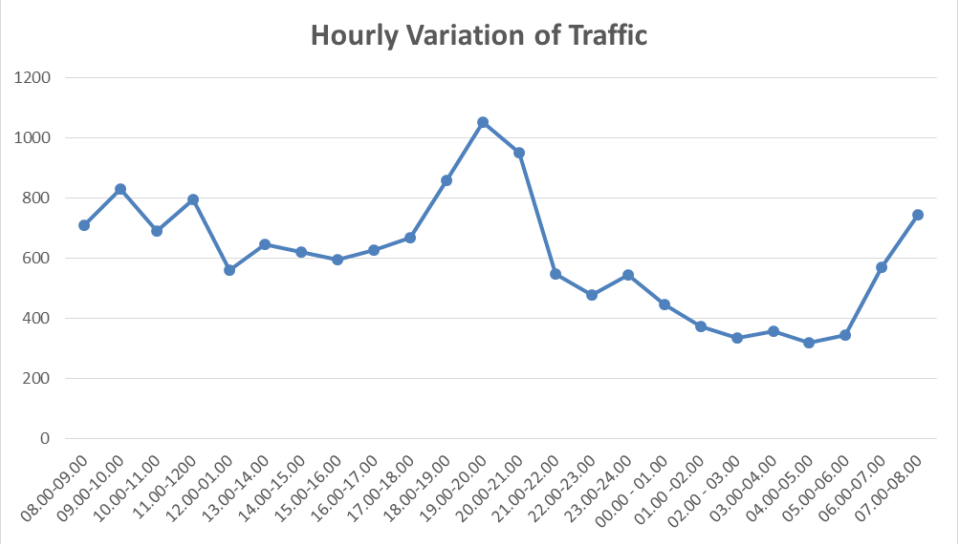


Figure 3-3: Hourly Variation of traffic on SH-18

The major mode observed at this location is Two wheelers (52%) followed by Car (13%). Goods vehicles accounts to 28% of the total traffic. The details of traffic composition on SH-18 (b/w Salem & Harur) is given below.

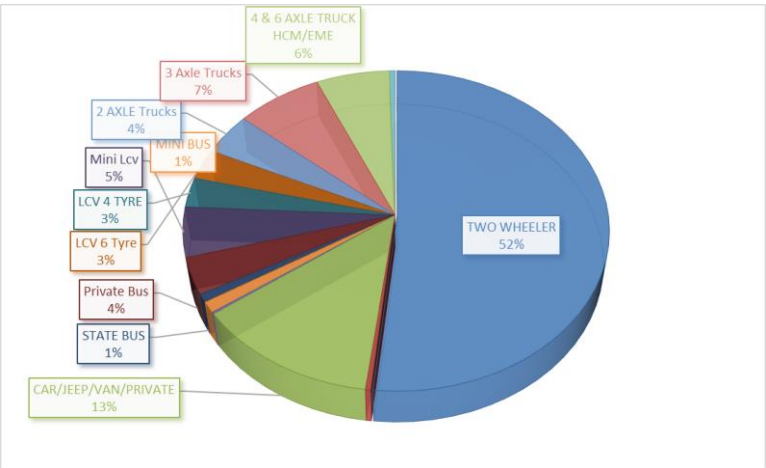


Figure 3-4: Traffic composition on SH-18 (b/w Salem & Harur)

3.5.2 Origin and Destination Survey

The travel characteristics of the road users is one of the main inputs in the traffic growth rate estimation as it helps in demarcating the project influence area of the project corridor. The origin-destination survey conducted in **June 2016** at toll plaza locations for all modes had taken as the basis for the analysis. Apart from that, as part of the study have conducted the OD survey on SH18 at Harur – Salem Section to know the any potential diversion from the project corridor.

Zonal Influence of the traffic on SH 18 (alternative road)

The major contributing zones on SH18 (alternative road) are as shown below.

Table 3-5: Region wise zone contribution

Zone Name	Passengers	Goods
Krishnagiri	3.0%	4.0%
Vellore	4.5%	2.9%
Salem	1.4%	2.4%
Dharampuri	27.6%	17.5%
Namakkal	1.8%	2.8%
Erode	2.6%	2.8%
Coimbatore	8.0%	7.1%
Villipuram	25.5%	13.9%
Thiruvanmalai	6.6%	5.7%
Kanchipuram	1.5%	1.6%
Dindigul	2.2%	1.2%
Chennai	4.6%	16.0%
Rest of Tamil Nadu	2.9%	0.1%
Bangalore	0.5%	1.7%
Andhra Pradesh	4.5%	12.4%
Kerala	2.2%	4.9%

State	Passenger	Goods
	% Share	% Share
Tamil Nadu	92.09%	78.18%
Karnataka	0.79%	1.91%
Kerala	2.21%	4.93%
Andhra Pradesh	4.50%	12.37%

It can be observed from the above table that mainly the traffic is from the Dharampuri & Vellore district along the project corridor at surveyed (Harur) location. More than 90% of passenger traffic and More than 75% of freight traffic is from Tamilnadu and only 0.5% of passenger vehicles and 1.7% of the goods vehicles are observed from Bangalore side.

CHAPTER 4

Network Impact Assessment of PIA

4. Network Impact Assessment of Project Influence Area

4.1 Background

This chapter presents the details of diverted and developmental traffic on the project road. The diverted traffic section covers the details of the diversion to alternate routes as well as modes. The opinion survey carried out on site along with our route reconnaissance surveys (condition of roads, travel time, facilities on route etc.) by travelling on that particular route has been used to evaluate whether the particular route is a potential alternate route to avoid the toll plaza on project road. All potential competing routes and modes were identified and risk assessment has been done to determine traffic likely to be diverted on various routes and modes after toll imposition. The developmental traffic likely to occur over the years on project road has been estimated using the details of upcoming projects in PIA.

4.2 Traffic Diversion

4.2.1 Alternate Routes

The routes which appear to be a potential alternate route that can be used to avoid the toll plaza on project road is as presented below.

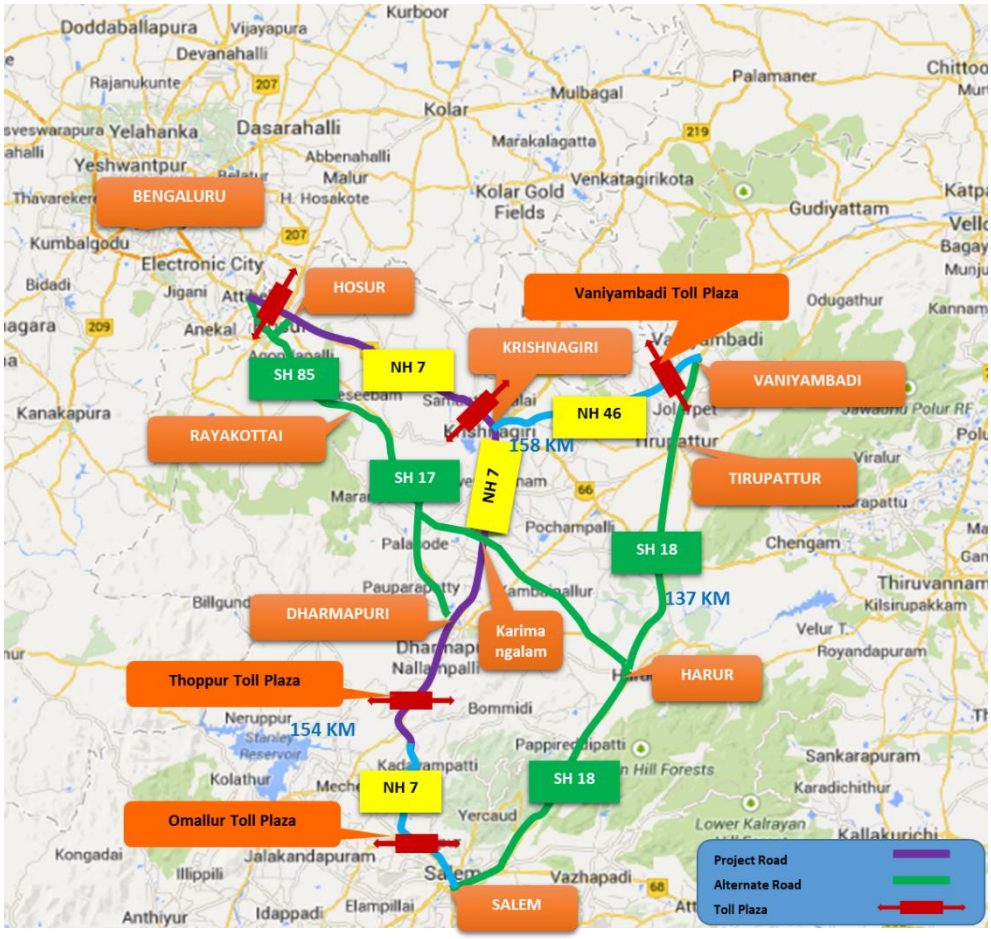


Figure 4-1: Map Showing Alternate routes

The traffic from Salem and down south to Dharampuri, Krishnagiri, Hosur, Bengaluru and beyond can use either NH-7 or (SH-18+SH-60A). Similarly traffic from Salem and down south to Vellore and Chennai can use either (NH-7+NH-46) or SH-18. For the current study three day volume count was conducted on SH-18. The summary of volume count is as presented in the Table below.

Table 4-1 Summary of Traffic Volume Count on SH-18

Mode	ADT				
	*Dec 2014	*July 2015	#June 2016	*Aug 2016	$May 2017
Car	1170	2186	1664	2550	1471
Bus	880	497	729	767	625
LCV	1015	728	599	430	1243
2A	747	605	535	354	472
3A	1411	858	756	744	805
MAV	413	466	559	537	685
Total	**5636**	**5340**	**4842**	**5382**	**5301**

** Vaniyambadi to Tirupattur section; # Tirupattur to Uttangarai section, $ Harur to Salem section*

The Average daily Traffic using this corridor is 15000 PCU. As this is a two lane road the capacity of this corridor is 15000 PCU/day. (*Source: IRC:64-1990*). It is already reached its capacity, and so there is no scope for further diversion of traffic from project road onto this road.

SH 18 (125 kms) road network falls under Salem, Dharmapuri, Krishnagiri, Vaniyambadi PWD divisions as lengths mentioned in the below table. Though some stretch of SH18 (Salem to Uttangarai) is part of Six/Eight Lane Triangular Corridor : Coimbatore - Chengalpet Alignment as per Tamil Nadu Vision document 2023, as of now there is no improvement proposals for this section of alignment.

Road Number	Name of Road	Division	Start	End	Length in km
SH18	Salem-Tirupattur-Vaniyambadi Road	Salem	0	16.16	16.16
		Dharmapuri	16/160	69/0	52.84
		Krishnagiri	69/0	93/6	24.6
		Vaniyambadi	93/6	125/0	31.4

The Other available potential route for traffic plying towards Bangalore is via SH-18, Harur, Kariamangalam, SH-17. DIMTS have compared traffic volume on this road with the previous Volume counts conducted before operation of Check post. The average daily traffic observed at this location both in Jun 2016 and July 2015 is given in the following table.

Table 4-2: Summary of Traffic volume count at Kariamangalam check post

Mode	ADT (Jul 15)	ADT (Jun 16)	ADT (Aug 16)
Car	1021	421	920
Bus	185	109	121
LCV	152	86	119
2A	139	235	64

Mode	ADT (Jul 15)	ADT (Jun 16)	ADT (Aug 16)
3A	549	172	215
MAV	249	72	195
Total	**2295**	**1095**	**1635**

Source: Data provided by the client

From the above table, it can observed that there is a change in variations of traffic past 2 years in the MDR 271 (Kariamangalam to Harur section). Before the check post operations on this road, total traffic was 2295 nos' and since the start of check post the traffic numbers reduced which were again picked by Aug'16. Consultant opinion is that this road wouldn't be any threat to the project road traffic in the future.

4.3 Potential divertible traffic due to Traffic restrictions on SH18

As per the Road Safety Meeting Action Plans, Tirupattur, Vellore Dist. Dated 11.03.2017 point no.7 clearly says that "*From 8.00AM to 8.00 PM, outstation heavy vehicles are restricted to enter into Tirupattur town to avoid the congestion happening in the urban settlements of Tirupattur town and to reduce the accidents along the corridor in SH 18 and to ensure the road safety. Hence, Sub collector, Tirupattur has directed L&T (KWTL) to erect the check post at Chettiyappanoor junction (@km 50 of NH 46, also known as Vaniayambadi jn) and given the authority to stop the vehicles and divert to NH 46 during these 12 hrs".*

*By considering this effect "*Restriction of the traffic at Tirupattur town by erecting the check post at Vaniyambadi jn." consultant assumed that there are operational restrictions for the commercial vehicles in the hours from 8 am to 8 pm. These restrictions are yet to be notified, once notified, it has been assumed that the additional traffic on to the KTTL Toll Plaza from SH18 road will be in the tune of 2/3 of the potential divertible traffic (potential divertible traffic is 32.90% arrived from present OD survey on SH18 analysis).

Table 4-3: Divertible traffic to KTTL due to Traffic restrictions on SH18

LCV	2 AXLE	3 Axle	MAV	Total
79	59	99	83	320

Due to traffic restrictions on SH-18, it has been assumed that there is 58%% realisation of estimated traffic in FY18 and 100% realisation of estimated traffic in FY19 onwards.

Table 4-4: Additional Estimated Traffic due to traffic restrictions on SH18

Year	LCV	2AT	3AT	MAV	AADT	Remarks
FY 2018	45	34	57	48	184	Around 58% realisation in FY18
FY 2019	80	60	100	93	335	
FY 2020	82	62	102	105	351	
FY 2021	84	63	103	118	368	

Year	LCV	2AT	3AT	MAV	AADT	Remarks
FY 2022	85	65	105	133	388	
FY 2023	87	63	104	147	401	
FY 2024	89	62	103	162	415	
FY 2025	91	60	102	178	431	
FY 2026	93	58	102	196	449	
FY 2027	95	57	101	216	468	

4.4 Traffic risk due to Sand Mining regulation

Sand mining from rivers in the State could be curtailed in the wake of recent guidelines issued by the Union Ministry of Environment and Forests stipulating that mining in quarries with lease area of five to 25 hectares should be done only manually.

The stipulation forms part of the guidelines issued by the Ministry on December 24, 2013, for grant of environmental clearance and categorisation of Category B mining projects into B1 and B2. While projects under B1 category (with sand mining area of 25 hectares and above) will require an Environment Impact Assessment report after a public consultation process, B2 category projects will be appraised based on a pre-feasibility report and other documents.

Almost all sand quarries that are functioning now in Tamil Nadu with environmental clearance from the State Environment Impact Assessment Authority (SEIAA), including those on the Cauvery and Coleroon rivers in Tiruchy region, fall under the B2 category as they have mine lease areas between five and 25 hectares.

However, there is lack of clarity on whether the guidelines are applicable to existing quarries too. Environmental activists say that they are enforceable straightway. The latest guidelines, which are based on the recommendations of an expert committee headed by the director of National Environmental Engineering Research Institute, are applicable to existing quarries too and the State government should enforce them.

Impact of sand mining on the project corridor has been observed in FY 2018 **(till Aug'17)**. Origin-Destination survey conducted in **June 2016** at toll plaza location indicates the Share of sand commodity including empty trucks is as follows.

Table 4-5: Sand Commodity share on project corridor

Vehicle type	2AT	3AT	MAV
Commodity Share	6.60%	7.20%	6.40%

Due to Sand mining regulations, it has been assumed that there is a 100% loss of sand carrying truck traffic in Q1 & Q2 of FY 2018 which was also observed in Q1-FY18 and 50% recovery from Q3 & Q4 of FY-18 onwards. Which means the AADT estimated for FY 2018 doesn't have any sand commodity traffic and also it is assumed that sand mining will recover

and around 50% of the trucks will start plying on the project road from start of Q3-FY2018 onwards.

Future projections are based on the recommended traffic growth rates which is detailed in the next chapter "Traffic Growth Rate Estimation". The recovery of Truck traffic due to sand mining operations regulations is estimated as follows.

Table 4-6: Recovery of Truck traffic due to sand mining operations regulations

Year	2AT	3AT	MAV	AADT
FY 2018	34	49	45	128
FY 2019	69	98	102	269
FY 2020	71	100	114	285
FY 2021	73	101	129	303
FY 2022	74	103	145	322
FY 2023	72	102	160	334
FY 2024	71	101	176	347
FY 2025	69	100	193	363
FY 2026	67	100	213	380
FY 2027	65	99	234	399

4.5 Developmental Traffic

As per the data available on public domain there is no development proposed in an around the project road which can have an impact on the traffic plying on the project road.

4.6 Additional Truck Traffic due to restriction on Overloading

From the analysis of Axle load Survey conducted in the month of July 2017, additional truck traffic due to restriction of overloading has been estimated as follows

Table 4-7: % of Additional Truck Traffic due to restriction on Overloading

Vehicle type	LCV	2AT	3AT	MAV
Share	3%	1%	4%	10%

Consultant's opinion is that overload truckers will pay excess fee (i.e. 1 X toll fee in addition to normal fee) and there will be a readjustment of loading happens due to restriction on overloading over the time period. It has been assumed that the effect of readjustment happens over a period of time as per the following assumptions. And the balance of the overloaded trucks will get converted to additional trucks on the project road.

Table 4-8: Assumption on Overloaded Truckers

FY	
FY18 (Q4-FY18)	100% Overload Truckers will pay excess fee (i.e. 2X toll fee)
FY19	100% Overload Truckers will pay excess fee (i.e. 2X toll fee)
FY20	75% of Overload Truckers will pay excess fee (i.e. 2X toll fee)
FY21	50% of Overload Truckers will pay excess fee (i.e. 2X toll fee)
FY22 onwards	25% of Overload Truckers will pay excess fee (i.e. 2X toll fee)

The excess paying truck traffic due to overloading based on the above assumptions is estimated as follows

Table 4-9: Estimated Excess paying Truck Traffic due to Overloading

Year	LCV	2AT	3AT	MAV	AADT
FY 2018	13	5	18	93	129
FY 2019	51	22	73	418	563
FY 2020	39	17	55	353	464
FY 2021	27	11	37	265	340
FY 2022	14	6	19	149	187
FY 2023	14	6	19	164	202
FY 2024	14	5	19	180	219
FY 2025	14	5	19	199	237
FY 2026	15	5	18	219	257
FY 2027	15	5	18	241	279

Additional truck traffic due to restriction on Overloading is estimated as follows

Table 4-10: Estimated Additional Truck Traffic due to Overloading

Year	LCV	2AT	3AT	MAV	AADT
FY 2018	0	0	0	0	0
FY 2019	0	0	0	0	0
FY 2020	19	4	31	90	144
FY 2021	38	8	63	203	312
FY 2022	58	12	96	342	508
FY 2023	59	12	95	377	543
FY 2024	60	12	95	415	581
FY 2025	62	11	94	457	623
FY 2026	63	11	93	503	670
FY 2027	64	11	93	553	721

* It is assumed that the excess paying tolling on account of overloading will start from 01st Jan-2018 i.e. Q4-FY2018 onwards.

CHAPTER 5

Traffic Growth Rate Estimation

5. Traffic Growth Rates Estimation

5.1 Background

The investment priorities are governed by the traffic demand, assessed benefits and cost of the project. Demand plays the important role, which governs the type of facility / infrastructure to be created. This in turn determines likely benefits and costs to develop the same. A highway project of this nature calls for significant investment. Prediction of traffic demand becomes an important task and has to be carried out near accurately. The accurate estimation of traffic has direct bearing on the viability of project. Recognizing this, efforts are to be made to carefully assess all the parameters that help in predicting the traffic demand in future which necessitates realistic estimation of traffic growth rates. Traffic growth on a road facility is generally estimated on the basis of historical trends, in the present case traffic growth rates are estimated using Elasticity method as per IRC-108-1996.

5.2 Approach

Traffic forecasting for project road traffic was done considering past trend in growth and analysing future prospects of project influence area. Elasticity approach of growth rate estimation was used for long term traffic forecasting.

The flow chart presenting the approach and methodology adopted for growth rate estimation is as presented in the figure below.

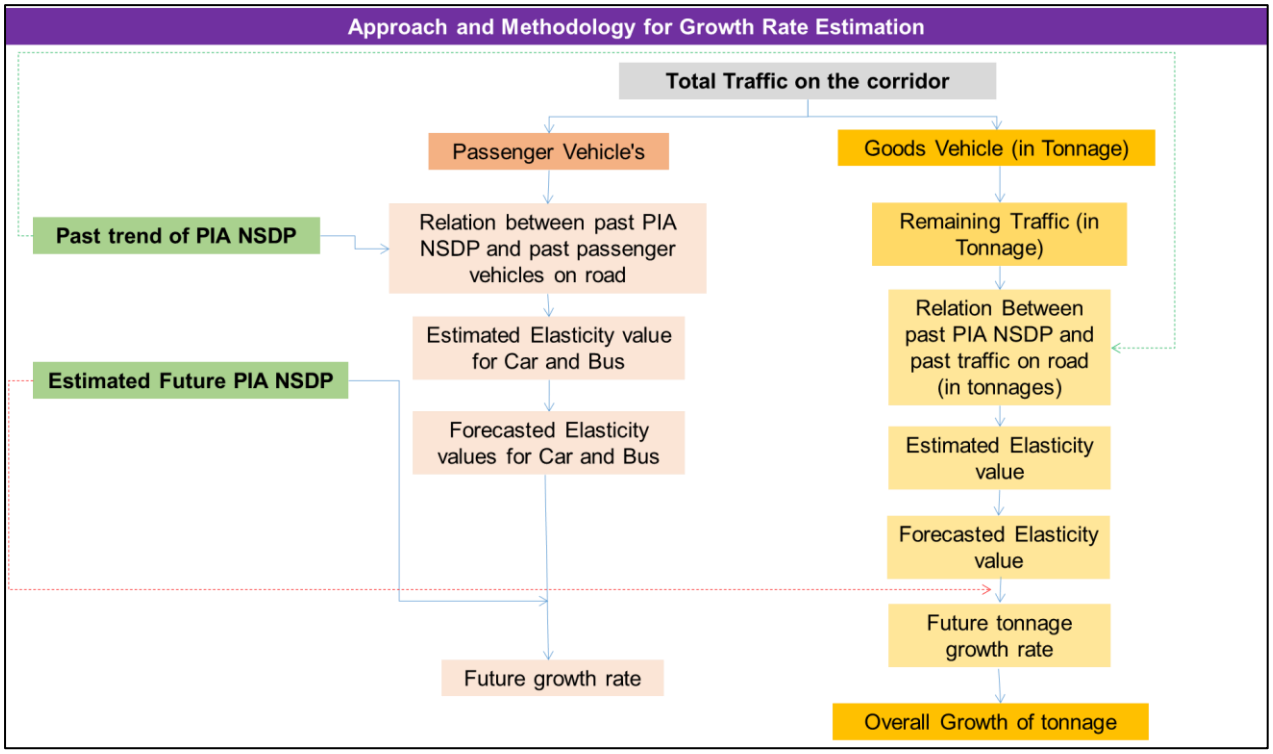


Figure 5-1: Flow Chart for Growth Rate Estimation

The approach included following steps

i) Various traffic streams using project road were differentiated in various categories as per their respective characteristics.
ii) Each stream was analyzed separately with respect to past trend of growth and development profile of its influence area.
iii) Potential of Growth of various vehicle categories were separately assessed based on its probable market share in expected multi-modal development.

5.3 PIA and Traffic Streams

A study of the socio-economic profiles of the regions comprising the project influence area (PIA) provides an overview of the factors likely to influence the pattern of economic development and hence the flows and volumes of traffic on the proposed highway. The details include population, Per-capita Income, NSDP, GDP (India) and targeted growth rates of the economy. The profiles help to generate basic inputs for the estimation of future growth in transport demand on the basis of past scenario, perspective changes in transport demand elasticity and economic growth rates.

The analysis of traffic pattern observed on the project road (at the toll plaza location) indicates that the vast majority (above 95 per cent) of traffic is originating from/ destined to A Tamil Nadu, Karnataka and Kerala. Hence, these states have been considered as PIA states for traffic.

Since drivers of growth for all the traffic streams would be different, these were analysed separately. In addition, truck traffic was analysed considering LCV, 2 Axle and 3 Axle rigid trucks/ Trailer - MAV separately to take into account the expected changes in freight vehicle market share in future years.

5.4 Growth Trends

To analyse growth potential for this traffic stream, past trend of growth of traffic on NH-7 at toll plaza location was analysed. The traffic count which are considered for analysis are from FY 2010 to FY 2016. The growth at all the locations are as presented in the table below.

Table 5-1: Past Traffic Growth at Palayam Toll Plaza

Year	Car	Bus	LCV	2A	3A	MAV	AADT
FY 2005	1568	1241	534	3893	2520	148	9904
FY 2009	2903	1013	1078	1954	2872	516	10336
FY 2010	4069	1493	2071	2203	3239	582	13658
FY 2011	5252	1675	2707	2232	3482	625	15974
FY 2012	6182	1736	3157	2174	3189	1058	17496
FY 2013	7787	1707	2248	2183	3275	1086	18286
FY 2014	8046	1669	2002	2473	2781	1346	18317
FY 2015	8633	1641	2070	2725	3579	1731	20380
FY 2016	10304	1746	2162	2456	2685	2528	21883
*FY 2017	11320	1764	2237	2335	2924	2753	23333
CAGR (10-17)	**15.74%**	**2.41%**	**1.10%**	**0.84%**	**-1.45%**	**24.86%**	**7.95%**

Source: Toll Plaza data, *FY 2017 adjusted for Demonetisation impact

The correction to the traffic for the year FY 2017 due to demonetisation is based on the observed traffic / revenues from FY 2017 and FY 2016 (no impact from demonetisation).

The analysis of past growth at the toll plaza location indicates following:-

- There has been a significant growth of Cars, LCV and MAV's.
- 2 Axle and 3 Axle are is reducing
- Overall the traffic is growing at 7.50 %.

5.4.1 Growth in Tonnage

As observed there is significant difference in the growth of different categories of goods vehicles. Also at a national level the trend shows that the sale of 2 Axle (even to an extent now 3 Axle) category of goods vehicles are decreasing, and on the other hand the growth in the sale of multi axle vehicles is significant. To accommodate this dynamic changes within the sale of goods vehicles of different categories in growth rate estimates, it is pragmatic to consider the overall growth of tonnage on project road at different locations. Once the growth of tonnage is established the tonnage share of different categories of vehicles shall be assumed based on the past trend at each locations. Using this growth in tonnage and assumed future tonnage share of different categories of goods vehicles the growth rate of each category will be back calculated.

To determine, growth of tonnage, vehicular traffic was converted into total tonnage considering payload of 4 ton, 9 ton, 15 ton and 25 ton for LCV, 2 Axle, 3 axle and MAV- Trailer respectively. This payload is in line with applicable GVW limits imposed by Government on various truck categories. The tonnage at the toll plaza location was estimated and analysed with data available from FY 2010 to FY 2016 and is provided in the tables provided below.

Table 5-2: Tonnage Growth at Palayam Toll Plaza

Year	LCV	2A	3A	MAV	Total
FY 2009	4311	17586	43081	12897	77875
FY 2010	8286	19826	48585	14544	91241
FY 2011	10826	20092	52230	15635	98784
FY 2012	12628	19569	47833	26440	106471
FY 2013	8994	19645	49122	27153	104914
FY 2014	8010	22253	41716	33653	105632
FY 2015	8280	24525	53681	43306	129792
FY 2016	8649	22107	40283	63212	134250
*FY 2017	8948	21015	43860	68825	142648
CAGR (2010 -17)					**6.59 %**

*FY 2017 Demonetisation impact and correction and commercial vehicle restrictions on SH18

In terms of growth of total tonnage, Palayam Toll Plaza indicates a positive growth of 6.59 %.

5.4.2 Growth in Registered Vehicles

The growth in vehicle registrations in the project road influence region is generally a good indicator, as it is found to correlate reasonably well with traffic growth. Thus, it is possible to

establish a definite trend and correlation between traffic growth and vehicle registration. To establish future traffic on the project corridor, the trend in vehicle registrations of the neighbouring states, which are significantly contributing traffic to the corridor (for this project 95% of the traffic is from Tamil Nadu, Karnataka and Kerala), is also studied. The vehicle registration data for the state of Tamil Nadu, Karnataka and Kerala is as presented below. These figures are taken from the Road Transport year book published by MORTH from time to time.

Table 5-3: Vehicle Registration Data for the State of Tamil Nadu

Category	Car	Truck	Bus
2004-05	9,76,155	509942	82547
2005-06	10,44,559	547055	89991
2006-07	11,32,442	584854	97396
2007-08	12,38,712	620979	105897
2008-09	13,53,150	649136	114671
2009-10	14,88,336	685040	123999
2010-11	16,71,947	744663	134887
2011-12	18,65,435	821108	1,44,251
2012–13	20,35,311	896985	156470
CAGR (2005-13)	9.62 %	7.31 %	8.32 %

Source: India Stat.com/ State wise/ Transport

Table 5-4: Vehicle Registration Data for the State of Karnataka

Category	Car	Truck	Bus
2004-05	6,39,548	221913	38052
2005-06	7,44,579	276013	40819
2006-07	8,66,280	312272	45211
2007-08	10,24,348	344764	49586
2008-09	11,41,532	366597	44308
2009-10	11,90,933	377495	53874
2010-11	13,33,589	415491	58012
2011-12	14,54,309	454582	62,501
2012-13	16,26,924	506340	69718
CAGR (2005-13)	12.38 %	10.86 %	7.86 %

Source: India Stat.com/ State wise/ Transport

Table 5-5: Vehicle Registration Data for the State of Kerala

Category	Car	Truck	Bus
2004-05	600566		95486
2005-06	691383		127574
2006-07	717786	64454	396980
2007-08	801187	65707	414678
2008-09	905488	66868	430162
2009-10	1048877	68777	383229
2010-11	1219949	72534	390430
2011-12	1397990	76330	396826
2012-13	1590625	78796	404153
CAGR (2005-13)	9.26 %	2.26 %	14.02 %

Source: India Stat.com/ State wise/ Transport

Table 5-6: Vehicle Registration Data for PIA

Category	Car	Truck	Bus
2004-05	866060	403414	72084
2005-06	945237	442419	79949
2006-07	1037698	481569	103709
2007-08	1155639	514491	111762
2008-09	1270112	539277	117403
2009-10	1384031	566604	123116
2010-11	1556414	617080	132047
2011-12	1730398	679284	139978
CAGR (2005-12)	10.39%	7.73%	9.94%

It can be observed from the above table that the CAGR for Car, Truck and Bus are 10.39 %, 7.73% and 9.94% respectively.

5.4.3 Past Growth in Regional Economies

Growth of traffic on the project road depends on existing development and future growth prospects of the connecting regions. The time series data of economic indicators at constant (2004-05) prices for Tamil Nadu, Karnataka and Kerala as published by Central Statistical Organisation are presented below.

Table 5-7: Economic Indicators for Tamil Nadu

Year	Gross State Domestic Product (Rupee in lakhs) @ 2004-05 prices	Net State Domestic Product (Rs. lakhs) @ 2004-05 prices	Population	PCI (Rs.)
2004-05	21900322	19364503	64416000	30062
2005-06	24956705	22158791	64933000	34126
2006-07	28752968	25628576	65435000	39166
2007-08	30515680	27233984	65919000	41314
2008-09	32179336	28674358	66386000	43193
2009-10	35663186	31675986	66836000	47394
2010-11	40341573	35996050	67273000	53507
2011-12	43323803	38650813	67698000	57093
2012-13	44794362	39747091	68107000	58360
2013-14	48061805	42718219	68501000	62361
2014-15	51545756	45898663	68881000	66635
2015–16	54142331	48199880	69438163	70033
CAGR (2005-16)	8.58 %	8.64 %	0.68 %	7.99 %

Source: India Stat.com/ State wise/ Transport

Table 5-8: Economic Indicators for Karnataka

Year	Gross State Domestic Product (Rupee in lakhs) @ 2004-05 prices	Net State Domestic Product (Rs. lakhs) @ 2004-05 prices	Population	PCI (Rs.)
2004-05	16674713	14872898	55327000	26882
2005-06	18427703	16403065	55992000	29295
2006-07	20266010	18108596	56647000	31967
2007-08	22820215	20380990	57292000	35574
2008-09	24442138	21830924	57927000	37687
2009-10	24759029	21836349	58552000	37294
2010-11	27272131	24081677	59170000	40699
2011-12	28278400	24804028	59780000	41492
2012-13	29824104	25950050	60382000	42976
2013-14	31435555	27453093	60975000	45024
2014-15	34410571	30107076	61560000	48907
2015-16	35581198	30802187	62246964	50032
CAGR (2005-16)	7.13 %	6.84%	1.08%	5.81%

Source: India Stat.com/ State wise/ Transport

Table 5-9: Economic Indicators for Kerala

Year	Gross State Domestic Product (Rupee in lakhs) @ 2004-05 prices	Net State Domestic Product (Rs. lakhs) @ 2004-05 prices	Population	PCI (Rs.)
2004-05	11926400	10477605	32875000	31871
2005-06	13129393	11549986	33154000	34837
2006-07	14166669	12462466	33426000	37284
2007-08	15409268	13574746	33694000	40288
2008-09	16265920	14409392	33958000	42433
2009-10	17757135	15712270	34216000	45921
2010-11	18985071	16717844	34467000	48504
2011-12	20495672	18081208	34708000	52095
2012-13	22184990	19607691	34942000	56115
2013-14	22620850	19947798	33832269	58961
2014-15	23671247	20873899	34931174	61329
2015-16	24854339	21918675	35113710	64329
CAGR (2005-16)	6.90%	6.94%	0.60%	6.59%

Source: India Stat.com/ State wise/ Transport

Table 5-10: Economic Indicators for PIA

Year	Gross State Domestic Product @ 2004-05 prices	Net State Domestic Product @ 2004-05 prices	Population	PCI (Rs.)
2004-05	19920426	17642194	60044870	29372
2005-06	22524427	20002674	60583933	32945

Year	Gross State Domestic Product @ 2004-05 prices	Net State Domestic Product @ 2004-05 prices	Population	PCI (Rs.)
2006-07	25642768	22856946	61109790	37213
2007-08	27572659	24599652	61620595	39788
2008-09	29172974	26002874	62117029	41744
2009-10	31721698	28131980	62598961	44731
2010-11	35624283	31708140	63069810	49925
2011-12	37982005	33761905	63529806	52801
2012-13	39497810	34867231	63976423	54303
2013-14	42354061	37350479	64322739	57732
2014-15	45369191	40249806	64801819	61783
2015-16	47510981	42060711	65367493	64577
CAGR (2010-16)	**6.96%**	**6.93%**	**0.72%**	**6.31%**

5.5 Transport Demand Elasticity

While the past traffic growth trend are generally helpful to indicate growth pattern likely to extend in near future, it is not appropriate to use it for long term forecasts as demand changes are usually because of shifts in the pattern of economic activities in the influence area. Therefore, future traffic forecasting was done using elasticity approach which takes into account the elasticity of transport demand and probable pattern of future growth of the economy.

The Elasticity Method relates traffic growth to changes in the related economic parameters. This method studies, in an appropriate perspective, the changes in observed past traffic volumes in the context of changes in relevant economic indicators in the Project Influence Area (PIA), to which it was closely related in the past. Such parameters include Net State Domestic Product (NSDP), income accruing to the major sectors of the economy, etc. This method takes into account not only the past growth of the major economic indicators, but also the future perspective. According to IRC-108, 1996, elasticity based econometric model for highway projects could be derived in the following form:

$Log_eP = A0 + A1\ Log_e(EI)$

Where:

P = traffic volume;

EI = Economic Indicator;

A0 = Regression constant;

A1 = Regression co-efficient (Elasticity Index).

Elasticity values for each mode is estimated using the past vehicle registration data and the growth of PIA NSDP. The elasticity's obtained are as presented below.

Table 5-11: Elasticity value based on Vehicle Registration data and Growth of PIA NSDP

Vehicle Type	Elasticity
Car	1.09
Bus	1.04
Trucks	0.77

Vehicle registration data represents all vehicles registered in the PIA region, but does not indicate actual number of vehicles plying on the road owing to vehicles taken off the road due to lack of fitness certificate as well as preference of owners of personalized modes (cars and two-wheelers) for registering their vehicles in neighbouring states, where taxes are lower, thereby giving an inflated picture of the vehicles in the state. Hence, there is a need to moderate values obtained from registration data to reflect traffic demand situation on highway. In addition, significant change in fleet mix of goods vehicle has been observed and this trend is likely to continue in truck trailer segment. It is also important to take into account the impact of this trend while traffic forecasting. This has been done as follows;

- The elasticity values determined in earlier section based on vehicle registration data were re-examined by relating growth of cargo on road with NSDP.
- To determine the elasticity of demand with respect to freight cargo, average growth of freight (tonnage) was estimated at the toll plaza location. The growth of tonnages at TP is 13.85%. This growth was compared with NSDP growth of traffic in influence area which was observed as 7.92%. The elasticity of demand worked out based on tonnage was 1.14 for Palayam Toll Plaza. This has been adopted as basis for future forecasting of elasticity.
- High elasticity of cars being witnessed now is because of large demand facilitated by financing schemes and loans. Factors like growth of Per Capita Incomes, reduction in the prices of entry-level cars, growth of the used car market, changes in life style etc., have all contributed to the rapid growth in ownership of cars. However, such trend would slow down and elasticity can be expected to decline. In view of all this, combined with the travel pattern of vehicles moving on the road, elasticity value obtained by using registration data has been moderated.

Keeping in view the above points, elasticity values were estimated using the past trend of growth in vehicles and tonnage on the project corridor and the growth in the NSDP value of the PIA area.

Table 5-12: Elasticity value based on past trend and Growth of PIA NSDP

Elasticity	Palayam Toll Plaza
Cars	2.25
Tonnage	0.95
Bus	0.24

Projected elasticity values for various vehicle types are given below. Elasticity values in the initial period are related to observed elasticity values and also considering the low economic growth period especially in the FY 2013 and FY 2014. Generally the spread of economic development induces changes in the spatial distribution of activities and corresponding changes in transport demand elasticity. As regions become more and more self-sufficient, the need for long-distance transport diminishes. Accordingly, it was assumed that transport demand elasticity, for both freight and passenger traffic, would tend to decline over time, despite growth in per capita income.

Table 5-13: Projected Elasticity Values for Cars and Tonnages

Elasticity Values			
Year	**Car**	**Bus**	**Tonnage**
2019-2022	1.80	0.30	1.03
2023-2027	1.70	0.28	1.00

Multi-axle vehicle are likely to achieve higher market share due to economic operations, causing lesser pavement damage and more strict enforcement on overloading. Govt. is also likely to promote the usage of Trailers by providing certain incentives.

5.6 Future Growth of PIA

We had sourced the historical data for state GSDPs and national GDP from the NITI Aayog website (http://niti.gov.in/content/gsdp-constant2004-05prices-percent-growth-2004-05-2014-15) and computed the linear correlation between the growth rate of state GSDPs with the national GDP growth in the historical period (From 2005-06 to 2013-14). This linear correlation for individual states was then applied on the forecast national GDP growth rate to arrive at the forecast growth rates for the state GSDPs. State GSDPs and national GDP of 2014-15 can't be used as the same is computed considering 2011-12 prices as base.

The Future India–GDP are arrived based on estimates projected by different renowned agencies like WB, ADB, Rating agencies and CSO, India and the same are provided in the table below.

Table 5-14: Projected Growth of India and PIA

Year	India GDP	PIA NSDP
2019-2022	7.00%	7.88%
2023-2027	6.05%	6.69%

5.7 Projected Traffic Growth Rates

Based on the projected elasticity values for Palayam Toll Plaza and the growth of PIA, the future average annual compound traffic growth rates by vehicle type have been estimated by using the following relationship:

TGR = (NSDPgr) x E

Where,

TGR – Traffic growth rate for mode

NSDPgr – growth rate of NSDP in PIA

E – Elasticity value for mode

For freight vehicle, the tonnages on the corridors are projected. The existing market share of different category of goods vehicles are then adjusted for the future years based on the past trend observed (share of 2 Axle trucks are reduced and the share of MAV are increased). Using the future market share of different categories of goods vehicles and the projected tonnage value, the number of goods vehicles in future years are calculated. The growth observed for different vehicles are presented in the table below.

Table 5-15: Recommended Traffic Growth Rates

Year	Car	Bus	LCV	2AT	3AT	MAV
2018-22	13.14%	2.19%	1.88%	2.32%	1.39%	12.58%
2023-27	10.54%	1.73%	2.17%	-2.47%	-0.72%	10.08%

5.8 Effective traffic growth rates

Considering various future impact events on the project road the effective traffic growth rates are derived by considering, sand mining regulations, regulations on over loading and restrictions on truck traffic movement on SH18. The below table presents the effective YoY recommended traffic growth rates for the Palayam Toll plaza on the project road.

Table 5-16: Effective Traffic Growth Rates – Recommended

Growth Rate	Car	Bus	LCV	2AT	3AT	MAV
FY 2019	13.14%	2.19%	3.23%	5.16%	4.67%	15.69%
FY 2020	13.14%	2.19%	2.59%	2.49%	2.45%	15.25%
FY 2021	13.14%	2.19%	2.58%	2.49%	2.44%	15.19%
FY 2022	13.14%	2.19%	2.58%	2.49%	2.43%	15.13%
FY 2023	10.54%	1.73%	2.17%	-2.47%	-0.72%	10.08%
FY 2024	10.54%	1.73%	2.17%	-2.47%	-0.72%	10.08%
FY 2025	10.54%	1.73%	2.17%	-2.47%	-0.72%	10.08%
FY 2026	10.54%	1.73%	2.17%	-2.47%	-0.72%	10.08%
FY 2027	10.54%	1.73%	2.17%	-2.47%	-0.72%	10.08%

CHAPTER 6

Traffic and Toll Revenue Forecast

6. Traffic & Toll Revenue Forecast

6.1 General

This chapter presents estimates of total corridor traffic on project corridor and the corresponding revenue for the recommended effective growth rates. The traffic at toll plaza location is forecasted using the recommended traffic growth rates as presented in Chapter 5.

6.2 Effective Traffic Projections on the Project road

The traffic on the project corridor is forecasted using the Recommended Traffic Growth Rates is presented in Table 5-16. The forecasted traffic on the project road is presented below.

Table 6-1: Effective Forecasted Traffic – Recommended

FY	Car	Bus	LCV	2AT	3AT	MAV	AADT
2018	**12973**	**2056**	**2545**	**2119**	**2803**	**2913**	**25409**
2019	14677	2101	2628	2228	2934	3370	27938
2020	16606	2147	2696	2284	3006	3884	30623
2021	18788	2194	2765	2341	3080	4474	33642
2022	21257	2242	2837	2399	3154	5151	37040
2023	23497	2281	2898	2340	3132	5670	39817
2024	25973	2320	2961	2282	3109	6242	42887
2025	28710	2361	3026	2226	3087	6871	46278
2026	31735	2401	3091	2171	3064	7563	50025
2027	35078	2443	3158	2117	3042	8326	54165

6.3 Toll Revenue Forecasting

Toll revenue projections or forecasting will be calculated based on the projected traffic and projected toll rates. The future traffic was mentioned in detail in the previous sections of this chapter. Toll rates by vehicle and toll category depends on the tolling length, wholesale price index (WPI) and the base rates which are applicable by vehicle category are according to the NH Fee notification for the project.

6.4 Toll plaza details

The toll plaza location and length covered is tabulated in table below as per the CA (Schedule R).

Table 6-2: Toll plaza Details

Toll Locations	From Km	To Km	Length in Km	Length (in km) for which Fee is payable
154.440 (Toll Booth) Palayam	94.000	180.000	86	86

6.5 Toll revenue estimation

i. Toll Fee Revision Methodology

Toll fee shall be computed based on the base rate fixed by NHAI and is revised annually as per the formula provided by NHAI in Schedule G of the Concession agreement and also as mentioned in the toll notification issued by the Government (Department of Road Transport and Highways) on 14th January, 2009. Below sections provide the summary of the same.

a) Base Rate

As per the National Highway Fee Rules, 1997 the rate of fee for use of a section of national highway, having regard to the expenditure involved in building, maintenance, management and operation of the said stretch of the said National highways for the base year 1997-98 are given as mentioned below in **Table 6.7**. Fee applicable shall be the rate multiplied by the length of the highway section for which toll is to be collected.

Project road as mentioned in the toll notification starts from Km 94.000 and ends at Km 180.000 thereby the total length of the project is 86 kms. Fees shall be calculated based on the rate of fee mentioned in the below table and shall be rounded off to nearest five rupees.

Table 6-3: Base rate fee by vehicle category

Type of Vehicle	Base Rate fee per Km (in rupees)
Car, Jeep, Van	0.40
Light Commercial Vehicle or Mini Bus	0.70
Bus or Truck (2 Axle)	1.40
Multi Axle > 2 Axle Truck	2.25

b) Annual Revision of Rate of Fee

The amount of fee and the revision thereof effective from 1st September every year shall be calculated as follows:

$$\text{Applicable Fee} = \text{Base Rate X} \left\{\frac{\text{WPI B}}{\text{WPI A}}\right\} X\ Length\ (in\ Km) of\ the\ said\ stretch$$

where

WPI-A is the Wholesale Price Index on August, 1997.

WPI-B is the Wholesale Price Index on August 31st preceding the fee revision date.

The actual fees to be charged shall be rounded off to the nearest one rupee. And the recent NHAI circular / notification says the user fee shall be rounded off to nearest five rupee from 01st Sep 2017.

ii. WPI Forecasts

a) Wholesale Price Index

Wholesale price index (WPI) tracks the price movement of key commodities of national relevance grouped under three main categories Primary Articles, Fuel & Power and Manufactured Products. Based on this individual movement, the WPI is determined through the averaging principle.

Till the year 2010 the index was computed with base year 1993-94 for about 435 commodities grouped as above. The index published by the Office of Economic Advisor, Prime Minister's Office on weekly basis.

In the recent past base series of WPI has been changed from 1993-94 to 2004-05. As mentioned elsewhere in the report the number of commodities also have been modified in the recent base year (2004-05) WPI. Consumer items widely used by the middle class like ice-cream, mineral water, flowers, microwave oven, washing machine, gold and silver shall be reflected in the new series of WPI. The **Table 6.4** shows the difference in old and new WPI Series.

Table 6-4: Comparison of WPI 1993-94 Series and WPI 2004-05 Series

Sl No	WPI 1993-94 Series(Old)	WPI 2004-05 Series(New)
1	Total No of Commodities considered is 435 items.	Total No of Commodities considered is 676 items.
2	The number of components considered and its weightage in this series are as follows; Primary Articles- 98 & 22.025% Fuel & Power- 19 & 14.226% Manufactured Products- 318 & 63.749% All Commodities-435 & 100%	The number of components considered and its weightage in this series are as follows; Primary Articles-102 & 20.118% Fuel & Power- 19 & 14.910% Manufactured Products- 555 & 64.972% All Commodities-676 & 100%
3	The number of price quotations as per this series are as follows; Primary Articles- 455 Fuel & Power- 72 Manufactured Products- 1391 All Commodities-1918	The number of price quotations as per this series are as follows; Primary Articles- 579 Fuel & Power- 72 Manufactured Products- 4831 All Commodities-5482

In order to maintain continuity in the time series data on wholesale price index, it is imperative to provide a linking factor so that the new series, when released, may be compared with the outgoing one. The linking factor with the old series (1993-94) for the three broad groups of commodities WPI are shown in **Table 6.5.** WPI for March, 2015 as per new series is 176.10.

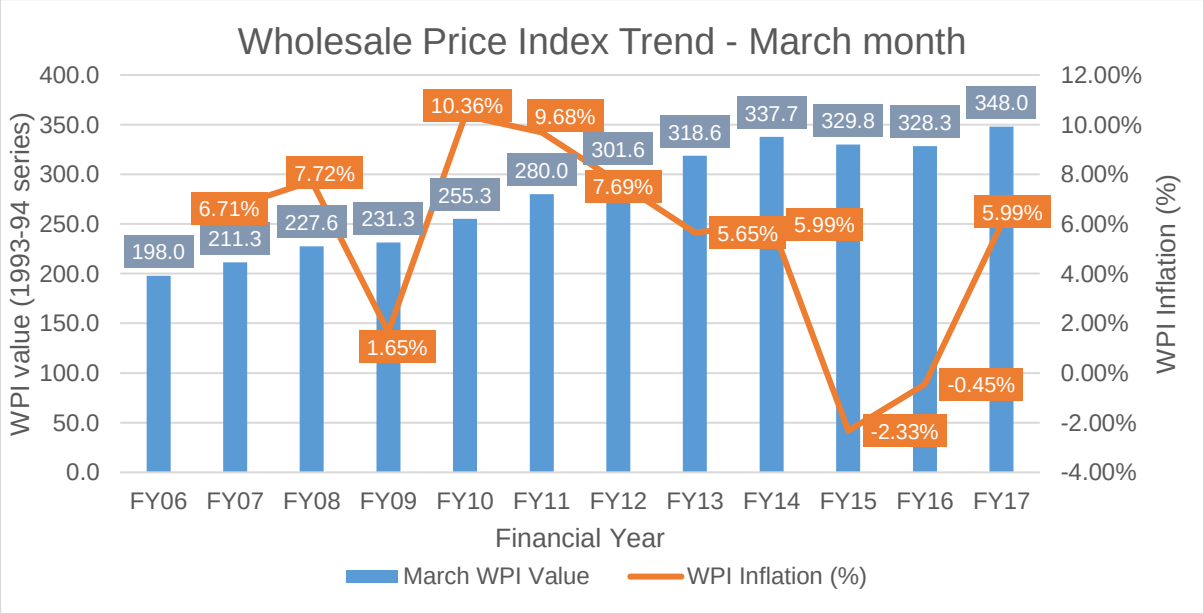
Table 6-5: Linking Factor with 1993-94 Series for three broad groups

Category	Average WPI in 2004-05	Linking Factor
All commodities	**187.3**	**1.873**
Primary articles	188.1	1.881
Fuel & Power	280.2	2.802
Manufactured products	166.3	1.663

b) Past trends of the Wholesale Price Index

Past data of WPI from 2006-16 is collected and analysed for its trends. WPI Trends with base year 1993-94 (new series values converted using the linking factor mentioned in the table above) for all the Commodities category over a period of 10 years and summarized in the Figure 6-1.

Figure 6-1 Past Trend of Whole Sale Price Index



The average WPI Inflation (%) for the last ten (10) years was around 5.20%, whereas during FY15 and FY16 the inflation was -2.33% and -0.45% respectively which is mainly due to the lower commodity prices like Oil, Metals etc. along with the drop in the prices of the primary articles like food products etc. The final inflation for the month of March 2017 (i.e. applicable inflation rate for the revision of toll rates from Sep'17) is 5.99% which is changed from 5.70% (provisional).

a) Wholesale Price Index projections

The future Wholesale price index values based on the past trend and specific importance was given to the recent WPI inflation (%) values. The adopted WPI inflation values are provided in the **Table 6-6** below which are sourced from Oxford.

Table 6-6: WPI Inflation (%) Projections

Year	FY-19	FY-20	FY-21	FY-22	FY-23	FY-24	FY-25	FY-26	FY-27
WPI Inflation	4.59%	5.67%	6.02%	5.73%	5.36%	5.16%	4.99%	4.48%	4.11%

iii. Toll Fee Projections

a) Base Year (FY18)

Toll fee for the base year FY18 has been arrived by considering project length distributed to each toll plaza (here in the present case it is only one toll plaza location) as mentioned in the toll notification. The toll fee calculated for the year 2017 - 2018 (from 01st September, 2017 to 31st August, 2018) for the toll plaza location by vehicle category is shown in **Table 6-7** below.

As per Schedule of User Fee (Schedule R) of concession agreement for the Project, the per km base fee/toll rates as applicable for year 1997 are given in Table 6-3. The escalated toll rates for 2017-18 are provided in Table 6-8 and as per the recent circulation issued by NHAI the user fee rates shall be rounded off to nearest 5 rupees.

Table 6-7: Unit Toll Rates Adopted for Year 2017 - 2018

S. No.	Category of Vehicle	Capping Rate of base fee per vehicle per one way trip For year 1997 (in rupees per km)	* Capping Rate of base fee per vehicle per one way trip For 2017-18 (in rupees per km)
1	Car	0.40	1.0594
2	LCV	0.70	1.8539
3	Bus or Truck (2 Axle)	1.40	3.7078
4	Multi Axle > 2 Axle Truck	2.25	5.9590

** Revised as per rules given in CA using WPI.*

Table 6-8: Toll Fees for the year FY-2018 (effective from 01st September, 2017)

Vehicle Type	Toll Fee category at Km 154.440 Palayam Toll Plaza (Rs.)		
	Single	Return	Monthly
Car	90	135	2700
LCV	160	240	4800
Bus or Truck (2 Axle)	320	480	9600
Multi Axle > 2 Axle Truck	510	770	15300

Note: w.e.f 01.09.2017- 31.08.2018

Toll fees are projected for the remaining future years balance in the concession period based on the assumed WPI Inflation values and the revision formula mentioned in the section 6.3.2.

6.6 Toll Concessions

The discounts allowed for local traffic/frequent users as per Schedule R of the Concession Agreement are given below.

Concessional fee for the multiple trips within a day (continuous period of 24 hr.) and monthly pass for use of section continuously and frequently will be @1.5 times and 30 Times of single journey rates respectively. Monthly pass of Rs.150/and Rs. 300/for local traffic with in radius of 10 km and between the radius of 10 to 20 form the toll plaza location respectively.

Daily pass of Rs. 15/and Rs.25/for LCV and Trucks respectively for each entry of playing with in 20 kms. Monthly pass of Rs1000/ for school Buses crossing the Toll Plaza.

6.7 Vehicle wise Trip categories and Trip Rates

Toll revenue is estimated by considering different concessions provided to the road users by vehicle category and also eligible number of trips based on the toll category. The number of eligible trips in crossing toll plaza varies by the toll fee category i.e. trip category above mentioned fees by toll category which was mentioned in the table above. For example return journey allows unlimited trips (hypothetically) in 24 hours effective from issue of time of the ticket receipt whereas the actual trips will vary by vehicle category and toll fee category. **Table 6-9** and **Table 6-10** summarises the vehicle wise trip categories and trip rates which were arrived from the analysis of actual traffic & revenue data for the year FY 2017-18 during the month of Apr-2017.

Table 6-9: Vehicle wise Trip Categories

Mode	Single	Return	Monthly	Local Traffic (<10 Km)	Local Traffic (10-20 Km)	Toll Exempt	Violation
Car	55.13%	39.27%	0.38%	0.73%	1.33%	3.12%	0.05%
Bus	25.92%	19.23%	51.89%	2.21%	0.00%	0.75%	0.00%
LCV	55.77%	40.73%	0.79%	-	-	2.68%	0.02%
Truck (2 Axle)	71.26%	27.24%	1.02%	-	-	0.47%	0.00%
Multi Axle > 2 Axle Truck	90.84%	8.79%	0.06%	-	-	0.25%	0.05%

Table 6-10: Vehicle wise Trip Rates for all Toll categories

Vehicle Type	Trip rates at the Km 154.440 Palayam Toll Plaza				
	Single	Return	Monthly	Local Traffic (<10 Km)	Local Traffic (10-20Km)
Car	1.00	2.31	1.588	15.2	12.1
LCV	1.00	2.35	1.672	1.00	
Buses	1.00	2.59	3.146	35.63	
Trucks (2 - Axle)	1.00	2.09	1.793	1.00	
MAVs (incl. 3AT)	1.00	2.99	1.284	1.00	

6.8 Toll revenue projections

Toll revenue is projected based on the future traffic projections, toll fees by vehicle and toll category and trip rates. Traffic numbers are projected by financial year i.e. FY17, FY18 etc. whereas the toll fees are revised on 01st September every year. Hence the toll revenue is calculated based on the differential fee rates applicable for the time periods April to June and July to March in the financial year. Toll revenues are projected based on the effective growth rates including revenues from overloading (both excess paying trucks and additional trucks) and without overloading are presented in the below Tables.

Table 6-11: Toll revenue projections (₹ millions) –Considering with Overloading

FY	Q1	Q2	Q3	Q4	Total
2018	423.45	438.99	472.73	484.11	**1819.28**
2019	539.34	545.26	545.26	533.41	**2163.28**
2020	607.98	614.67	614.67	607.98	**2445.30**
2021	691.20	698.79	698.79	683.60	**2772.39**
2022	791.18	799.87	799.87	782.48	**3173.41**
2023	884.68	894.40	894.40	874.95	**3548.42**
2024	986.82	997.66	997.66	986.82	**3968.97**
2025	1099.44	1111.52	1111.52	1087.35	**4409.82**
2026	1222.07	1235.50	1235.50	1208.64	**4901.70**
2027	1327.10	218.75*			**1545.86**

Table 6-12: Toll revenue projections (₹ millions) –Considering without Overloading

FY	Q1	Q2	Q3	Q4	Total
2018	423.45	438.99	472.73	462.46	**1797.63**
2019	514.53	520.19	520.19	508.88	**2063.78**
2020	586.35	592.80	592.80	586.35	**2358.31**
2021	674.30	681.71	681.71	666.89	**2704.61**
2022	781.26	789.84	789.84	772.67	**3133.62**
2023	873.31	882.90	882.90	863.71	**3502.83**
2024	973.82	984.52	984.52	973.82	**3916.67**
2025	1084.58	1096.50	1096.50	1072.66	**4350.24**
2026	1205.18	1218.43	1218.43	1191.94	**4833.98**
2027	1308.40	215.67*			**1524.07**

*Concession period ends on 15th July 2026.